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DRINKING-DRIVING COUNTERMEASURE REVIEW:
THE CANADIAN EXPERIENCE

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The views expressed in this document are those of the authors and do not necessarily reflect those of the Addiction Research Foundation.

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SUMMARY

Evaluations of countermeasures implemented in Canada to reduce impaired driving and alcohol-related accidents and fatalities were reviewed. Intervention strategies to detect and/or deter impaired drivers encompassing the following are discussed: (i) legal measures such as prohibitive legislation and sanctions upon apprehension or conviction; (ii) mass media informational and educational campaigns to publicize drinking-driving legislation, increased police enforcement activity or simply the dangers of drinking and driving; (iii) rehabilitative programmes for convicted impaired drivers; (iv) technological aids to the prevention and detection of impairment; and (v) systems-oriented approaches. In general, the impact on target behaviours of most countermeasures has been limited and short-term. Factors such as low enforcement rate of laws and sanctions, low level of subjective perception of risk of apprehension, and little incentive to change behaviour, have contributed to the observed lack of positive effect. It was difficult to assess the full effect of many countermeasure efforts due to limitations imposed by methodological shortcomings of the evaluations, such as the absence of systematic record-keeping, poor research design, incomplete comparative data sets, and inadequate outcome measures. Overall, the findings suggest that a systems approach would be the most practical direction for countermeasure development. There is a need to change both drinking habits and driving habits. In order to

effect behavioural change, a systems-oriented strategy would focus on motivational factors and alternative actions to drinking and driving.

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1. INTRODUCTION

Alcohol involvement in traffic accidents in Canada has been well documented (eg. Farmer, 1973; Simpson, 1975; Inter-Ministerial Committee on Drinking and Driving, 1974; Traffic Injury Research Foundation of Canada, 1972) and unquestionably represents a serious traffic problem. In response to the adverse consequences of impaired driving upon human lives and property, various federal and provincial governments and agencies have implemented measures to counter the problem. Orchestrated attempts to reduce the incidence of driving after drinking, and the attendant consequences, theoretically address three levels of intervention: primary intervention strategies function to prevent the potential drinking driver from undertaking such behaviour, usually through public education and deterrence methods; secondary intervention strategies involve the detection of the drinking driver who is already on the road and his subsequent removal, most commonly through legislative and enforcement measures; tertiary intervention strategies aim to reduce recidivism among impaired drivers who have been detected, arrested and convicted, through sanctions and rehabilitation programmes. Researchers in the drinking-driving area typically classify countermeasures according to the focus of the approach taken to achieve the objective, that is a legal, health, public information/education, technological or systems approach (Jones and Joscelyn, 1978).

The following report represents a review of countermeasure programmes implemented in Canada to reduce impaired driving and alcohol-related accidents and fatalities. The extent of the presentation is limited to those studies available which have been reported and evaluated. An attempt has been made to group the efforts according to the major focus of the programme under one of the five countermeasure approaches. Three provinces (Alberta, British Columbia, and Ontario) have been actively involved in organized countermeasure efforts to reduce drinking and driving and Manitoba is currently developing a comprehensive programme. The Yukon Territorial Government has been instrumental in investigating the extent of impaired driving within its jurisdiction, documenting countermeasure efforts and recommending intervention strategies (Hursh, 1980, 1981; Braun, 1982). The remaining provinces have implemented more limited measures, mainly at the local level and during the holiday season (Premier's Interministry Task Force on Drinking and Driving, 1983).

2. LEGAL APPROACH

The legal approach to reduce the incidence of drinking and driving is based largely on the theory of deterrence. Briefly, deterrence theory involves the manipulation of the driver's subjective perception of risk of apprehension for impaired driving and/or collision and the attendant consequences (eg. licence suspension, fine, jail sentence, increased insurance premiums, injury, death, etc.). By increasing the driver's subjective perception of risk to a critical level through the implementation of countermeasures designed to increase the **actual** risk or simply the **perceived** risk, the potential drinking driver should be deterred from engaging in that behaviour. However, the level of subjectively perceived risk which must be achieved to function as an effective deterrent device is, as of yet, undefined.

Laws are generated to specify and prohibit drinking-driving behaviour. Violation of the provisions of the legislation results in punishment as provided for under the laws. The threat of punishment is a deterrent to drinking and driving. Through law generation, enforcement, adjudication and sanctioning, the traffic law system creates and maintains the deterrent threats to control drinking and driving (Joscelyn and Jones, 1972). Thus, the deterrent effect of legal-oriented countermeasures involves some combination of the perceived risks of detection, apprehension, arrest and conviction (Vingilis, 1982).

2.1. Legislation

Laws and regulations governing driver behaviour are designed to improve road safety. The sanctions or penalties applied against violators are intended to deter drivers from breaking the laws and to discourage the recurrence of illegal behaviour. Road safety is improved to the extent that the deterrence is effective.

2.1.1. Criminal Code Provisions Related to Impaired Driving

Law generation functions to provide a set of laws to regulate drinking-driving behaviour, and penalties for transgression. **Section 234** of the Criminal Code makes it a criminal offence to drive, or have care or control of a motor vehicle, whether it is in motion or not, while one's ability to drive is impaired by alcohol or drugs. **Section 236** makes it a criminal offence to drive, or have the care or control of a motor vehicle, whether it is in motion or not, having consumed alcohol in such a quantity that the proportion thereof in one's blood exceeds 80 mg.%. **Section 234.1** and **235** provide that everyone who, without reasonable excuse, fails or refuses to provide a sample of breath for the purpose of analysis in a roadside screening or breathtest device, after having lawfully been requested by a police officer to provide such a sample, is guilty of a criminal offence.

Conviction for a **first** offence provides for a sentence of a fine of not more than $2,000 and not less than $50, or imprisonment for six months, or both a fine and incarceration; for a **second** offence, where the prosecution proves a prior conviction, imprisonment for not more than one year and not less than fourteen days; and for a **third or subsequent** offence, where the prosecution proves two or more prior convictions, imprisonment for not more than two years and not less than three months.[2] Where it is not contrary to the public interest, the court may grant the offender a conditional discharge on condition that the offender attend a provincial treatment programme.

2.1.2. Breathalyzer Legislation

Examples of legislative changes implemented in Canada to reduce the incidence of impaired driving include the Criminal Law Amendment Act, enacted in 1969. The new legislation introduced the use of the breathalyzer into the impaired driving laws and provided an objective measure of BAC[3] to facilitate detection and conviction procedures. This per se law represented a significant change over the traditional impaired driving laws. For example, it raised the legal significance given to a BAC over 80 mg.%[4]

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[2] Penalties for Criminal Code Provisions related to impaired driving are currently under review for amendment.

[3] blood alcohol concentration

[4] 80 milligrams of alcohol in 100 millilitres of blood

from presumptive evidence of impairment to conclusive evidence of illegal alcohol consumption when combined with driving. Evaluation of the Breathalyzer Legislation is discussed under the systems approach.

2.1.3. **Roadside Breath Screening**

Another example of a legislative countermeasure is the 1976 legislation which provided for roadside breath screening. This law was enacted in an attempt to alleviate problems associated with subjective assessment of impairment on the part of the police and to increase apprehension rates. The impact of this legislation on impaired driving offences is described under the systems approach.

2.1.4. **Blood-testing for Alcohol Content**

Mandatory blood sampling of drivers involved in traffic collisions and suspected of being impaired has received much discussion in both federal and provincial government quarters over the past decade, but as yet has not been incorporated into the Criminal Code. As it stands now, the Criminal Code permits the taking of bodily samples only on a voluntary basis. However, both British Columbia and Saskatchewan have passed provincial legislation providing for blood sampling of suspected impaired drivers, with or without their consent, and Ontario and Manitoba parliamentarians are considering similar legislation. The Law

Reform Commission of Canada has recently made a similar recommendation to the Federal Justice Minister, stipulating however that samples be obtained only with the authorization of a court order and the attending physician. The British Columbia legislation came into effect October 1, 1983 and allows physicians to take blood specimens for the purposes of alcohol estimation for police without the consent of the impaired driving suspect (Toronto Star, 1983). Preliminary impact of the legislation has not been reported.

Blood sampling has been argued to be a viable measure for situations in which a crash-involved driver is suspected of being impaired but unable or unwilling to provide a breath sample, thus preventing the laying of a charge of a per se offence. The circumstances may entail the driver being unconscious or injured so as to be unable to provide a sample, or the driver feigns injury to avoid a breath test, or the driver is removed to a hospital, or is incapable of understanding the nature of a demand for a breath test and, therefore, of compliance (Premier's Interministry Task Force on Drinking and Driving, 1983).

2.2. Enforcement Activity

Law enforcement serves to manipulate driver behaviour by threat or perceived threat of apprehension. Enforcement of the drinking-driving laws increases the **actual** risk of detection and apprehension of drinking drivers, and has been shown to be instrumental in raising the **perceived** risk of apprehension (Vingilis, 1982). For example, in the Yukon, where there are few roads and a large police force, (there are twice as many officers per 1000 population in the Yukon as in the rest of the country), impaired drivers are quickly apprehended. Furthermore, the conviction rate is very high (90%). It is speculated that those drivers deterred from driving while intoxicated in this region do so from fear of being apprehended (Hursh, 1980). However, the chances of being detected while driving after drinking are generally low. Lawson (personal communication) has estimated that in Canada the risk of apprehension is 1 in 1183 legally impaired trips, or 1 in every 5915 impaired vehicle kilometres driven.

The impact of increased enforcement activity has been observed to be initially successful but impaired driving rates soon return to pre-intervention levels. The short-term effect has been hypothesized to be due to the realization on the part of the driver that the risk of detection is negligible (Ross, 1982). Increased enforcement activity has been an important component of many of the Canadian programmes evaluated, though rarely has the contribution of enforcement to the observed effect been separated from the overall impact of the programme. Examples of the enforcement function in countermeasure efforts are described under the systems approach (eg. R.I.D.E., CHECK-STOP, COUNTERATTACK).

2.3. Adjudication

The adjudication process acts upon the provisions of the drinking-driving laws. Examples of countermeasures operating within this area are restricted to technological developments intended to increase the efficiency of evidentiary measures, such as the videotaped sobriety test which was tested in British Columbia (described under the technological approach).

2.4. Sanctions

The imposition of sanctions is considered to be the ultimate deterrent threat of the traffic law system, the strength of which is determined by the perceived certainty, severity and celerity of punishment (Vingilis, 1982). Unfortunately the drinking- driving offence is one for which the general level of certainty of punishment is extremely low, most notably because the apprehension rate is low. According to deterrence theory, if the probability of punishment is so low as to be negligible, severity of the threatened punishment cannot be expected to influence behaviour (Ross, 1982). The general deterrent effect of sanctions is difficult to assess because of the influence of extraneous factors such as level of enforcement and mass media campaigns.

Sanctions are outlined by the drinking-driving laws and may be penal in nature intended to prevent recidivism among convicted impaired drivers (eg. fines, jail sentence, licence suspension) or simply preventive and issued immediately upon detection to remove the drinking driver from the road (eg. temporary licence suspension).

Specific deterrence measures are aimed at those individuals who have already been apprehended for an impaired driving offence. The purpose of specific deterrence measures is to prevent the offender from being involved in an alcohol-related driving incident in the future, such as an arrest or an alcohol-related collision. Sanctions function to modify drinking-driving behaviour, and may be punitive or rehabilitative in nature.

The specific deterrent effect of penal sanctions on subsequent impaired driving convictions or accidents is not fully known. Much of the research conducted in this area has been limited by methodological problems. The deterrent effect of a relatively high fine on impaired driving recidivism was demonstrated in a well-designed Australian study (Homel, 1976). However, it is difficult to impose a just system of fines. What may constitute an insignificant amount of money to one individual may impose a greater financial burden on another. Jail terms, on the other hand, may keep drinking drivers off the roads during imprisonment, but there is no evidence to show that they are effective in modifying drinking-driving behavour. A study of licencing controls demonstrated that mandatory licence suspension or revocation in addition to fines and/or jail sentences had a more positive effect on traffic safety among multiple impaired driving offenders than the sanctions of solely fines, incarceration or a combination of both (Hagen, 1978). The duration of the effect was sustained for up to four years on some traffic violation measures.

2.4.1. **Mandatory Licence Suspension**

Most provincial legislation (e.g. The Highway Traffic Act of Ontario) provide for the mandatory suspension of an offender's driving licence upon conviction for a Criminal Code impaired driving offence. Federal legislation provides for an additional period of licence suspension at the judges' discretion.

Mandatory licence suspension upon conviction for impaired driving as an effective drinking-driving countermeasure is questionable in light of research findings which indicate that a large proportion of drivers under suspension continue to drive. International studies indicate that 40% to 80% of those drivers whose licences have been suspended or revoked continue to drive (Farmer, 1973; Wilde, 1975). A reported 40,000 persons drive through Metro Toronto each day with their licence under suspension (Premier's Inter-Ministry Task Force on Drinking and Driving, 1983). Furthermore, the longer the period of disqualification, the greater the likelihood that it will be disregarded (Willett, 1973). Hagen et al. (1980) reported that 65% of drivers under a one-year suspension and 75% of drivers under a 3-year suspension continued to drive without a licence. Although not particularly effective in keeping convicted impaired drivers off the road, licence suspension does, however, reduce driving exposure. There is some indication that driving performance improves under these conditions so as to avoid detection while driving without a licence (Hagen et al., 1980). From this point of view, mandatory licence suspension may be considered to have a positive influence on traffic safety. The effect of this measure on reducing alcohol-involved accidents in Canada is not readily available. Lang et al. (1964) conducted a study in Ontario of licence reinstatement following mandatory licence suspension, but no information was reported on subsequent driving performance.

2.4.2. **24-Hour Licence Suspension**

The 24-hour, and more recent 12-hour licence suspension represent secondary intervention strategies designed to remove the drinking driver from the road without processing him through the courts. The intent of the 24-hour licence suspension legislation was to remove the drinking driver from the roads when there was suspicion that the driver was impaired but insufficient reasonable and probable grounds to prosecute. The measure was preventive rather than penal in that no offence was created, nor a reporting system concomitant with driving licences or driving records.

The 24-hour licence suspension was enacted in British Columbia in 1966[5], providing for a 24-hour suspension imposed at roadside by police on suspicion that the driver's physical or mental ability had been affected by alcohol, or that the driver's BAC exceeded 80 mg.%. The effect of the legislation on traffic safety was difficult to assess because of the absence of a central record keeping system of 24-hour suspensions issued. Available statistics in Vancouver indicated that police were using the suspensions more frequently than charges for drinking-driving offences under the Criminal Code (Morton et al., 1975). However, this would indicate simply a reduction in the number of charges laid, but not necessarily a reduction in drinking-driving behaviour. Accident rates prior to and subsequent to the legislation were not compared.

In 1969, Alberta legislated the 24-hour licence suspension[6] with provisions very similar to those implemented in British Columbia. The legislation represented one component of a province-wide programme (CHECK-STOP) to increase detection and apprehension of drinking drivers through increased enforcement and roadside spot-checks. The impact of the licence suspension legislation on traffic safety was not systematically evaluated. Suspension data were not systematically recorded. Available statistics from the CHECK-STOP programme indicated that police used the 24-hour suspension less frequently than the laying of drinking-driving charges (Morton et al., 1975).

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[5] Motor Vehicle Act. S.B.C. 1981, C.288, S.214

[6] Motor Vehicle Administration Act. S.A. 1981, C.M.-22, S.110.

The 24-hour licence suspension is also in effect in the Yukon, but its usefulness as an intervention strategy has not been systematically evaluated.

2.4.3. 12-Hour Licence Suspension

The 12-hour licence suspension legislation has been enacted in both Manitoba[7] and Ontario[8]. In Ontario the law came into effect in December, 1981. The new law empowered the police to suspend a driver's licence for a 12-hour period if the driver registered 50 mg.% or greater on a roadside screening device. As with the 24-hour suspension, the 12-hour suspension was a preventive measure, intended to remove the drinking driver from the road and to serve as a deterrent.

The impact of the legislation on traffic safety has not yet been fully evaluated, although it is probable that the legislation had little demonstrable effect. Although the overall fatality rate for Ontario had numerically decreased in 1982 from 1981 by 21.2%, similar decreases were found in almost all other provinces and territories. In fact, the overall fatality decrease for Canada was 22.7% (Transport Canada, 1983). Given that the other provincial and territorial jurisdictions did not pass similar licence suspension legislation to that of Ontario, it is unlikely that Ontario's decrease was due to the legislation alone. Furthermore, it seems that the components required for a successful countermeasure programme were not in place: an Ontario-wide police force survey found that six months after the legislation had come into effect, 41% of forces surveyed did not possess roadside-screening devices, a necessary element for licence suspension enforcement (Blefgen et al., 1983); secondly, a survey conducted by Transport Canada in the spring of 1983 found that the majority of residents were unaware of the legislation (Wilson and Jonah, in press). The basic tenet of the drinking-driving literature is that for legislation to be effective, it must be communicated to the public and enforced. Neither of these facets appears to have been adequately achieved in implementing the 12-hour suspension legislation in Ontario.

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[7] Highway Traffic Act. S.M. 1981, C.H.-60, S.238.1

[8] Highway Traffic Act. S.O. 1981, C.72, S.30a

2.5. Alcohol Control Policies

2.5.1 Legal Drinking Age

Changes in alcohol control policy have been legislated to regulate the use and abuse of alcohol and represent supportive legislative countermeasures. Among youth, the most common measure has been manipulation of the legal age for purchase and consumption of alcohol (Smart and Goodstadt, 1977; Vingilis and De Genova, 1984).

A variety of studies in several Canadian jurisdictions have researched the effects of minimum drinking age laws on accident involvement. Methodologically, some of these studies are weak, as they have used "alcohol-related" collisions as the dependent measure (Schmidt and Kornaczewski, 1973a, 1973b; Whitehead et al., 1975). The labelling of cases as "alcohol-related" has been subject to some controversy (Douglass and Filkins, 1974; Zylman, 1974a, 1974b) as these assessments are based on subjective reports by police, which may be inflated or biased estimates of alcohol involvement (Vingilis et al., 1982). Others have used surrogate measures, such as single-vehicle nighttime crashes or fatalities. Approximately 40% of these collisions are not alcohol-related (Ross, 1982); therefore, the magnitude of any changes as a function of the new minimum drinking laws is difficult to assess. These measures are probably more reliable than the aforementioned measures, but they still suffer from weaknesses. Coroner's reported alcohol-related fatalities that occur both in sufficient numbers and have high BAC testing are still considered the best measure available.

Studies using "alcohol-related" collisions as an outcome measure invariably have found significant increases relative to **reduced** drinking ages. Schmidt and Kornaczewski (1973a, 1973b) found a significant increase in the proportion of 16 to 19 year olds among all drivers involved in "alcohol-related" accidents in Ontario after the drinking age was lowered. Whitehead et al. (1975), examining crash data for a small Ontario city, reported increases of 174% for 18 to 20 year olds compared to 20% for 24 year olds involved in "alcohol-related" crashes. Total collisions for 18 to 20 year olds increased 28%.

Warren et al. (1977) investigated the impact on young driver fatalities of a **reduced** legal drinking age in four Canadian provinces: Alberta, Manitoba, Saskatchewan and New Brunswick. A number of interesting findings arose from this study. First, they found that the assessment of impact attributable to change in the drinking age varied as an inverse function of the length of the pre-change time series studied (i.e. a substantial impact on young driver mortality was observed when a short pre-change time series was employed, however use of a longer pre-change time series demonstrated no observable impact). This finding was verified in every study province. Second, although the number of young driver fatalities increased substantially (at variable time lags) following the changes in the legal drinking age, no impact of this change, independent of the rebound effects of the earlier changes to the Criminal Code in Canada, (i.e. introduction of the ".08" BAC legislation), could be identified. These results, however, must be viewed with great caution because use of yearly instead of monthly time series data points do not allow for the accurate examination of multiple intervention effects.

Two other studies on the effect of changing the drinking age on young driver collisions in Saskatchewan and Alberta offer evidence for the association between **reduced** drinking ages and increased alcohol-related collisions. Shattuck and Whitehead (1976) examined alcohol-related crashes among 16 to 20 year old drivers in Saskatchewan after the drinking age was lowered from 21 to 19 years in April 1970, and reported increases of 20% to 50%. The drinking age was lowered again from 19 to 18 years in June 1972, and further increases were observed. Thus, increased alcohol-related collisions among both newly enfranchised drinkers and underaged drinkers were related to reductions in the minimum drinking age. Similarly, Bako et al. (1976) reported an increase of 118% in the incidence of fatal collisions involving BAC's of 80 mg.% or greater among drivers aged 15 to 19 years in Alberta after the drinking age was lowered.

In 1979, the legal drinking age in Ontario was **raised** by one year to 19. The initial effect of this change in Ontario on traffic safety was reported by Vingilis and Smart (1981). Province-wide data on alcohol-related driving convictions and fatalities among offenders ranging in age from 16 to 21 years were compared for differences between the pre-intervention and post-intervention periods; conviction statistics collected for the period 1977 to 1979, and fatality statistics for the period 1973 to 1979 were analyzed by time series analysis. Comparisions were made between age groups. No significant differences were found in the numbers of drinking-driving convictions, total fatalities or coroner-reported drinking-driving fatalities prior to and subsequent to the change in the legal drinking age (see Table 1). Drinking-driving convictions did not differ significantly between the pre- and post-intervention periods for 16-17 year olds, 18 year olds, 19 year olds, or 20-21 year olds although for the latter age group the observed decrease almost reached significance. The direction of these changes, although not statistically significant, were downward for all age groups except the 19 year olds, for which the change was in an upward direction. Fatality data were based on coroner reports of driver condition: non-alcohol involvement versus "positive BAC". Pre-post-intervention differences in alcohol-involved fatalities failed to reach significance among any of the age groups. The authors concluded that although there were indications from other studies that the legislative change had a slight positive impact on alcohol use among 18-19 year old students (eg. Smart et al., 1980) and on the student body in general (eg. Vingilis et al., 1980), a major impact on traffic safety was limited by a legislated age increment of only one year and insensitivity of measures to small changes in conviction and fatality statistics.

2.5.2 Alcohol Availability

The effect of prohibition or restriction of the sale of alcoholic beverages on traffic saftey was investigated by Smart (1979), in a study of a change in legislation permitting local option votes on liquor policy in the Northwest Territories. The legislation was changed in 1976, and shortly thereafter several communities changed their alcohol policy of which three were examined. The subsequent policy change in Frobisher Bay represented a rationing measure, restricting the availability of alcohol beverages whereby the sole package store was closed but alcohol was still available through three alcohol sales outlets in town and air importation from Yellowknife and Montreal. The policy change in Rae-Edzo represented prohibition of alcoholic beverages for all residents. There were no alcohol sales outlets in the community although residents could import alcohol by air transportation or drive approximately 80 miles to Yellowknife. The third community, Fort Resolution, changed the alcohol policy the year prior to the legislation, whereby alcohol distribution was rationed as a predetermined quantity per person per week. There were no alcohol sales outlets in the community, but a package store was accessible approximately 60 miles by road. The policy changes were prompted by citizen action in most communities. Possible changes in enforcement, public attitude, or home brewing were not reported.

The evaluation of the effects of the policy changes involved a comparison of the three communities which changed their policies with two control communities which did not change their alcohol control policies within the study period. Inuvik, which did not experience a change in the number of package stores, was selected as a control for Frobisher Bay which closed its package store. Both were comparable in population size, ratio of white to nonwhite residents, degree of isolation, arrests per population base in 1975, and the system of alcohol beverage control prior to the policy change (ie. through stores, bars, air importation). Inuvik was also selected as a control for the community of Rae-Edzo, although the two were not particularly similar especially in population size. Pangnirtung was selected as a control for Fort Resolution. The population size of the two were comparable, and both were similarly isolated. The outcome measures were arrests for public drunkenness, assault and driving while impaired. The data were derived from police records. Rates of arrest were compared for differences between the pre-intervention and post-intervention periods. The pre-intervention period for Frobisher Bay and Rae-Edzo was two years, and one year for Fort Resolution. The post-intervention period was one year for all communities.

Chi square tests indicated that the changes in alcohol control policy had little or no impact on rates of impaired driving arrests (see Table 1). Comparing Frobisher Bay with the control, on rates of arrests for impaired driving (per 100 population) for the year preceding the change (0.9 and 1.9, respectively) and the year following the change (1.3 and 2.4, respectively) yielded no satistically significant differences. Similarly, the decrease in rates observed in Rae-Edzo from pre- to post-intervention (0.9 and 0.6, respectively) was not significantly different from that of the control (2.2 and 1.8, respectively). Nor did the change in rates observed in Fort

Resolution from pre- to post-intervention (4.7 and 3.6, respectively) differ significantly from the change observed in the control community (0.5 and 0, respectively). The authors suggested that the policy changes would have least affected drinking habits in the home or bar, and that because impaired driving usually followed drinking in these environs, a minimal change in arrest rates would not be unexpected. Also, the occurrence of impaired driving arrests may have been too rare an event to show a significant change from the pre- to post-intervention periods.

2.6 Summary

Legislation of mandatory licence suspension upon conviction for a drinking-driving offence has not been fully evaluated as an effective countermeasure in Canada. Nor is there conclusive evidence to date to suggest that roadside temporary licence suspensions signficiantly reduce alcohol-related accidents. Evaluation has been limited mainly by the absence of systematic recording-keeping of suspensions issued. The main problem with licence suspension as an effective countermearure is that the risk of apprehension is remote; unless the driver is in an accident or stopped in a routine check by police, the offences of drinking and driving while under suspension will most likely go undetected. Critics suggest that this type of countermeasure would be more effective if accompanied by extensive public information/education campaigns and high visibility enforcement to increase both the subjective perception and actual risk of apprehension.

Two examples of indirect legal countermeasures implemented in Canada have been reviewed. Legislating changes in the legal drinking age, and restricting the sale of alcohol beverages both represent primary intervention strategies to prevent drinking and driving. Some evidence was found for the effects on traffic safety of controlling the drinking age, but no consistent effect on traffic safety was observed as a result of the control of sale of alcohol. In the second example the lack of impact may be attributed to the geographical locale where driving conditions and exposure differ dramatically from more urban environments.

3. PUBLIC INFORMATION/EDUCATION APPROACH

Educational countermeasures consist primarily of mass media campaigns that attempt to inform the public of the potentially dangerous effect of alcohol on driving performance, and to persuade people not to drive after drinking. The campaigns are based generally on a rational appeal, assuming that people are unaware of the drinking-driving problem and that once they are made aware of the adverse consequences of this type of behaviour they will make a rational decision not to engage in it. Although the objective of many campaigns is to change attitudes and opinions towards responsible drinking-driving practices, the ultimate goal is a change in behaviour resulting in a reduction in impaired driving and alcohol-related accidents.

The emphasis in most evaluative studies, however, has been on attitude and knowledge change. There appears to be an implicit assumption that behaviour change will follow. But, as Blane and Hewitt (1977) state in their review of the effects of mass media efforts, "research findings concerning the effectiveness of public education programs related to alcohol suggest that messages disseminated by means of mass media may affect attitudes and knowledge levels but seldom make a significant impact upon behaviour."

Recent assessments of educational countermeasure efforts in the drinking-driving area suggest that positive approaches toward conveying information to the public and the combination of campaigns with other countermeasures will have a greater impact on effecting change in traffic safety than negative, fear-arousing and threatening messages in campaigns (Blane and Hewitt, 1977; Vingilis, 1982). Other components related to positive impact on traffic safety have been identified: campaign effectiveness is enhanced when the message is instructive, that is the audience is informed in an unambiguous and explicit manner what behaviour is desired; immediacy of the message to the time and place in which the targeted behaviour is relevant and which may be translated into the desired conduct without delay; content should be perceived as "personally" relevant rather than pertaining to the "the other person" on the road (Wilde et al., 1971). Overall, however, there has been little evidence that drinking-driving educational campaigns have had any measurable impact on reducing impaired driving collisions or their consequences (O.E.C.D., 1978; Wilde, 1975; Cameron, 1979).

Two Canadian campaigns are reviewed. Generally speaking they represent well-designed mass media efforts and the evaluations have few of the methodological shortcomings common to many other studies. Both used a pre-test/post-test, control group design with measures of traffic safety as well as those related to knowledge and attitude change.

3.1 Mass-Media Drinking-Driving Campaigns

3.1.1. 1971 Edmonton Campaign

A public information/education campaign for responsible drinking and driving was implemented in Edmonton, Alberta in December 1971. The prime objective of the campaign was to reduce the incidence of driving after drinking and eliminate driving after heavy drinking. The intent was to effect a change in knowledge, attitudes and behaviour by alerting the public to the problem of alcohol involvement in traffic accidents, inform the public of the effects of alcohol on driving performance, review the penalties for drinking-driving offences, and suggest alternative behaviours to drinking and driving. The target audience was social drinkers in the Edmonton area.

The campaign was conducted over a one-month period spanning the Christmas/New Year's holidays. Features of the campaign included distribution of placements, posters, pamphlets, payroll stuffers, billboards, taped radio broadcasts, press kits, essay contests in the junior high schools, public speakers and meetings with community organizations. The theme of the campaign was "If you drive after drinking ...", the phrase being completed with factual information about drinking and driving and the attendant consequences, and suggestions as to how to avoid alcohol-related accidents. Additional publicity was provided by coverage and support from the media. The Edmonton police department did not carry out special programmes nor increase enforcement levels during the campaign period.

The research design was experimental, involving a control city and pre- and post-intervention roadside surveys. Calgary, Alberta was selected as the control city and was comparable to Edmonton in population size, socio-economic characteristics, mass media communication systems, police force, and community concern for traffic safety, and geographically situated so as to minimize media overlap. Although designated as the control city, Calgary also conducted traffic safety campaigns during the holiday season which included the "Safe Driving Week Campaign", the "Holiday Safety Campaign", and the "Police Yourself" directed at drinking drivers, and involved the dissemination of statistics and informational materials to the media, bulletins to churches, public service announcements on radio, and the distribution of buttons. It was reported that greater media emphasis was placed on the enforcement function in the Calgary campaigns than in the Edmonton campaign, although enforcement activity did not change in the Calgary area.

The pre-intervention and post-intervention surveys involved roadside breath-testing and the administration of a self-report questionnaire among night drivers in both Edmonton and the control city Calgary. The roadside surveys were conducted between 7 p.m. and 2 a.m. on Thursday, Fridays and Saturdays, for a total of six nights over a ten-day period prior to, and a ten-day period subsequent to the Edmonton campaign. The six different locations surveyed in the pre-test were repeated in the same order in the post-test. A team of police officers and interviewers screened motorists with a roadside screening device, and a breathalyzer was used to determine the BAC level. The five-item questionnaire queried knowledge of drinking-driving laws, awareness of the drinking-driving problem in Canada, and opinion of drinking-driving laws. Items queried had not been given special emphasis in the campaign. Drivers were randomly selected, but participation was voluntary. The refusal rate was not reported. Publicity was given to the roadside surveys by the news media.

The campaign implementation and evaluation was reported by Farmer (1975). The Edmonton sample consisted of 2230 night drivers surveyed prior to and 2780 surveyed subsequent to the campaign; the Calgary control sample included 2162 night drivers in the pre-intervention and 3122 in the post-intervention surveys. Pre-test/post-test differences were compared between the campaign city and the control cities using chi-square analyses.

Results of the analyses indicated that the Edmonton campaign and the annual campaign activity in the control Calgary were both successful in conveying factual information about drinking and driving to the driving population and in changing attitudes but in most instances the impact was more apparent in

Edmonton (see Table 2). Specifically, a larger increase in knowledge of the legal blood alcohol level from the pre-test to the post-test was observed in Edmonton (54.3% and 63.2%, respectively) when compared with Calgary (45.0% and 48.0%, respectively). Similarly, the proportion of respondents estimating the "safe" number of drinks one can consume within a 3-hour period increased significantly from the pre-test to post-test in both cities, but the gains were much greater in Edmonton (32.7% in pre-test and 50.1% in post-test in Edmonton compared with 30.7% in pre-test and 34.3% in post-test in Calgary). In addition to becoming more accurate on this measure, Edmonton drivers adopted a more cautious attitude toward drinking and driving as evidenced by a smaller proportion estimating more than three drinks as being a safe consumption level. There was no significant change observed in the knowledge levels of alcohol involvement in traffic fatalities nor of culpability below the .08 BAC level from the pre- to post-testing in the campaign area. The attitude measure was concerned with the public's perception of current drinking-driving laws as being "adequate", "inadequate" or "too tough". Significant changes from the pre-test to post-test were observed in both cities, however the Edmonton campaign was instrumental in effecting a positive attitude towards the measures legislated to reduce impaired driving (33.1% considered the laws "adequate" in the pre-test compared with 41.3% in the post-test) whereas little change in acceptance was observed in Calgary (35.8% responded "adequate" in the pre-test and 36.2% in the post-test).

Impaired driving decreased significantly in the campaign area only. The proportion of drivers with a BAC level above 80mg% in Edmonton was 3.0% in the pre-test and 1.4% in the post-test, representing a statistically significant reduction; correspondingly, the proportion was 2.5% in the pre-test and 1.7% in the post-test in Calgary, a non-significant reduction. The author points out that some reduction in impaired driving is usually expected during the holiday season, but that the greater decrease observed in Edmonton suggests evidence for a campaign effect.

The evaluation was limited by several methodological shortcomings: the refusal rates in the roadside surveys were not reported; the control city was also exposed to drinking-driving campaign activity, preventing the separation of the observed outcome on traffic measures attributed to the effect of the Edmonton campaign from possible trends in traffic safety; and the same locations in the pre-test were used in the post-test, a situation in which test reactivity may have affected the findings. Also, there was no measure of the extent of exposure of the target audience to campaign materials.

This study demonstrates that public information/ education campaigns can be effective in communicating information about drinking and driving to the public and in reducing the incidence of impaired driving. The long-term impact of this type of countermeasure on traffic safety, however, was not examined.

3.1.2. 1973 Ontario Christmas Campaign

A mass media drinking-driving campaign was conducted in nine Ontario cities during the last three weeks of December 1973. The purpose of the campaign was, as a pilot project, to gather information and develop organizational strategies for a future comprehensive programme to reduce impaired driving. The objectives of the campaign were to raise the awareness of the public to the problems associated with drinking and driving, and to stimulate local community response in reducing the problems utilizing local resources. The campaign was targeted towards the entire community of each of the nine cities.

The campaign involved the dissemination of material regarding the laws, penalties and consequences of impaired driving, and provided the public with alternative actions to driving while impaired (such as the use of alternative transportation and drinking limitations for those who continue to drive after drinking). The campaign emphasized citizen involvement and community action to implement local countermeasure programmes against drinking-driving problems. Features common to all campaign cities included advertising materials (eg. billboards, posters, coasters, leaflets, placemats, games), radio and newspaper advertisements, and news releases. Television use was not a component of the campaign. Features initiated locally within campaign cities included among other activities supplementary campaigns, provisions of alternative transportation services, screenings of films concerned with drinking-driving, television and radio commentaries with drinking-driving content, and paid advertising by local media and industry.

The research design was experimental: the campaign was implemented in nine cities, and nine additional cities were designated as controls; the campaign and control cities were surveyed on criteria measures before and after the campaign. Campaign and control cities were selected so as to minimize radio broadcast overlap and, as a whole, to be comparable in geographical distribution representing highly populated areas of Ontario, population size, and number of alcohol-related accidents. There was no mention made of independent campaigns in operation during the study period in the control cities. The criteria measures were public awareness of drinking-driving problems, knowledge of the laws and penalties for drinking-driving offences, recall of campaign content, and behaviour related to drinking and driving. Telephone surveys were conducted during the month prior and the month subsequent to the campaign. Standardized self-report questionnaires requiring 10-15 minutes for completion were administered by the same local interviewers in the pre-campaign survey as the post-campaign survey. Four independent samples were randomly selected from files of licenced drivers and over 1000 drivers were interviewed in each of the four surveys, representing a compliance rate of 95%. The samples were homogeneous with respect to age, sex, marital status, car ownership and reported drinking behaviour, but significant sample differences were reported in education, occupation and average miles driven; the pre-test campaign sample was under-represented in low mileage drivers and the post-test campaign sample was over-represented by college-educated drivers and those in professional occupations.

Evaluation of the campaign was reported by Pierce et al. (1975). Tests for statistical significance were not specified. The analyses reportedly accounted for the observed sample differences in education and occupation whereas the experimental design accounted for historic and seasonal influences (i.e. by conducting the campaign in several cities rather than just one, and by the geographical distribution of the cities across the province).

The results indicated that the campaign had an immediate effect on some knowledge measures, awareness of drinking-driving issues, and self-reported impaired driving (see Table 2). Specifically, a significant increase in the proportion of respondents who knew the maximum legal breathalyzer reading for a driver from the pre-test to the post-test was observed for the campaign sample (34.7% and 44.7%, respectively) but not for the control sample (33.6% and 33.0%, respectively). Similarly, knowledge of a jail term as a possible penalty for a drinking-driving offence increased significantly from pre-test to post-test among campaign respondents (74.1% and 80.1%, respectively) but no change was observed among control respondents (77.0% and 76,.8%, respectively). Knowledge of a fine or a licence suspension as possible penalties was high in both samples (overall, 94% or more of respondents were aware of this information) and did not change significantly for either sample from the pre-test to the post-test. Changes in knowledge of penalties for drinking- driving offences should be viewed cautiously however, as a large proportion of the samples also responded positively to non-existant penalties (eg. over 50% thought re-education was a penalty and over 90% thought demerit points was a penalty for impaired driving).

Measures of campaign recall indicated that the campaign material reached a large proportion of the target audience, and that radio was the most effective medium for transmission of information, followed by newspapers and billboards; 42.8% of respondents in the campaign cities surveyed after the campaign recalled at least one item which could be identified as part of the campaign, compared with 18.0% in the control cities (attributable to some media overlap and/or travel from control cities to campaign cities). Increased awareness of the drinking-driving problem was evidenced by a significantly larger increase in the self-reported conversation about this issue with others from the pre-test to the post-test among the campaign sample (42.5% and 57.6%, respectively) compared with the control sample (43.5% and 50.9%, respectively).

The campaign was instrumental in effecting a change in at least one traffic safety measure. A significant reduction in self-reported impaired driving was observed among the campaign respondents only; 4.2% of campaign respondents in the pre-test and 8.5% in the post-test responded affirmatively to the question, "During the last month have you not driven home because you had drunk too much?", compared with 5.3% and 6.6%, respectively, in the control sample. The proportion of the campaign sample reporting that they had left their car at home before going to a party or bar so they would not have to drive increased significantly from the pre-test (15.0%) to the post-test (24.3%), but a similar increase was observed for the control sample (15.6% and 23.4%, respectively). Thus the change in behaviour could not be attributed to a campaign effect. Similarly, self-reported intervention in preventing an impaired person from driving increased significantly but at the same rate among both the campaign (18.9% in pre-test to 25.3% in post-test) and control samples (19.2% in pre-test to 24.9% in post-test). Statistics on collisions and the numbers of charges laid for drinking-driving offences were considered too small for useful statistical analysis.

The campaign had no measurable impact on opinions regarding court enforcement of drinking-driving penalties, nor allocation of police resources to apprehend impaired drivers.

In summary, the 1973 Ontario public information/ education campaign demonstrated an initial impact on some measures of knowledge and alcohol-related driving behaviour among the driving public. Attitudes, however, remained unchanged. Methodological considerations include first, samples which varied on several background characteristics although attempts were made to control for these differences, and second, indications that respondents were guessing to a certain extent. The evaluation assessed only short-term effects. Neither the long-term impact of the campaign nor the effect on traffic accidents and fatalities were examined.

3.2. Driver Education Programmes

Driver education courses are available in all provinces in one form or another, whether through private or public instruction. Formal driving instruction courses represent a primary preventive countermeasure inasmuch as the objectives of the programmes seek to prepare the new driver for the traffic system. Generally speaking, these programmes are viewed favourably as a means of improving driver performance and reducing accidents. In some jurisdictions certification from a driver education course is a requisite for licencing (eg. required for drivers 18 years of age or younger in Saskatchewan, and those 16 or 17 years old in Quebec), and graduates of pre-licencing courses often benefit from reduced insurance rates. But whether or not driver instruction programmes are successful in reducing the traffic injury and fatality rates among young drivers is the subject of much debate in the research literature. Evaluations of programme effectiveness have yielded no consistent outcome results (Pagé-Valin et al., 1977).

Young drivers are of particular interest for countermeasure efforts because proportionately they are over-represented in traffic collisions and fatalities. For example, 16-20 year old drivers constituted only 9.8% of licenced drivers in Ontario in 1979, but 19.7% of these drivers were involved in accidents and 22.6% were driver fatalities (Ministry of Transport and Communications, 1980; Traffic Injury Research Foundation of Canada, unpublished data). Explanations offered for these high rates among this age group include increased risk due to inexperience and a predominance of nighttime driving. Alcohol use, however, is clearly a major factor. A large proportion of young drivers killed (40.9% in Ontario during 1979) had been drinking prior to the crash (Traffic Injury Research Foundation of Canada, unpublished data).

During the 1970's, increased use of motor vehicles by young drivers and enhanced awareness of this age group as high-risk drivers generated interest in the utility of driver education as an intervention strategy. Most provinces, with the exception of Quebec, integrated driver education to some extent into the secondary school curriculum as a measure to reach the majority of new young drivers. The programmes vary in duration and content, but all offer theoretical lessons and practical driver training (Laberge-Nadeau et al., 1981). In Saskatchewan, for example, driver education courses were introduced into all secondary schools by 1974 and were available to all 15-17 year olds[9]; 68% of those eligible students graduated from the course. By comparison, only 15% of applicants for driver's licences in Ontario in 1976 were trained in high school courses (Select Committee on Highway Safety, 1977).

Whether or not the driver education courses address the salient issue of drinking and driving, (the Drivers Training School in the Yukon does reportedly include information on the effects of alcohol on the body and on driving ability), or are effective in reducing impaired driving among young people have not been systematically evaluated.

3.3. **Summary**

In summary, two public information/education campaigns were reviewed. Both incorporated control groups and pre/post testing into the evaluation. Both were comparable in length of duration and were conducted during the winter holiday season. Only one utilized television as a component of the campaign.

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[9] The legal minimum driving age in Saskatchewan is 15 years. Similarly, the age is lower in Alberta (ie. 14 years) than in the remaining provinces (ie. 16 years).

Both campaigns were successful in conveying information to the public, and produced some immediate impact on traffic safety measures although assessment of the full impact on traffic safety was limited by several methodological shortcomings. Attitudinal changes observed were inconsistent. The long-term impact of public information/education campaigns on traffic safety remains to be demonstrated. Thus while it may be the case that public information/education programmes do educate the public, there is yet no overwhelming evidence that they reduce traffic accidents.

Driver education programmes as effective intervention strategies to prevent impaired driving among young drivers have not been evaluated.

4. HEALTH APPROACH

The health approach encompasses tertiary intervention strategies to prevent recidivism. The focus is the convicted impaired driver. The rationale behind the approach is that convicted impaired drivers will be made aware of the dangers and risks of drinking and driving through rehabilitation programmes providing education and treatment and that this awareness will deter them from recidivating (Vingilis, 1982). The health approach is usually implemented in conjunction with the judicial system whereby the target population is drawn from those apprehended, convicted and sanctioned for violation of alcohol-related traffic offences. The education component of rehabilitation programmes generally involves the presentation of information related to drinking and driving and the attendant consequences, whereas the treatment component focuses on the drinking problems of the individual, although there is often overlap between the two.

Evaluations of American rehabilitation programmes present little evidence to support the efficacy of the health approach in changing the drinking-driving behaviour of programme participants (Nichols et al., 1981; Vingilis, 1982). A more recent review of rehabilitation programmes (Mann et al., 1983), however, suggests that educational programmes appear to increase knowledge about the attitudes toward drinking and driving but the effects on personal alcohol consumption and drinking problems are minimal, and that some effects on traffic safety measures have been demonstrated by quasi-experimental comparisons but not supported to any extent by experimental studies. Treatment programmes, on the other hand, appear to have a stronger impact on these measures.

4.1. Rehabilitation Programmes for Convicted Impaired Drivers

4.1.1. Alberta Impaired Drivers' Programme

The Alberta Impaired Drivers' Programme (A.I.D.P.) was first implemented in Edmonton, Alberta, in 1970. The objective of the programme was to improve driver attitudes toward both drinking and driving practices through an educational programme in an attempt to reduce alcohol-related traffic injuries and fatalities. The programme was based on the following premises derived from the Phoenix DWI Course: an offender will be better prepared to select alternatives to impaired behaviour and to modify his own once he is (1) informed of the influence of alcohol on driving skills and of the consequences of drunken driving, (2) encouraged to assess his own drinking and driving behaviour, and (3) allowed to explore the ramifications of this behaviour in a friendly, non-judicial group setting (Strachan, 1973).

The programme originally consisted of four two-hour educational courses scheduled over a four-week period. Course content was presented through films, informative materials, lectures and questionnaires, and covered the issues of federal and provincial legislation, licence suspension and reinstatement, insurance and the drinking driver, driving attitudes, driver training and defensive driving, phases of alcoholism, relationship of problem drinking to the problem driver, resources for driving and/or drinking problems, and probation orders. Assessment emphasis was placed on the modification of drinking-driving behaviour. Resource personnel volunteered. The programme was later modified to one full day of lectures, film presentation and discussion supervised by moderators employed by the Alberta Motor Association, and expanded to centres throughout the province. Currently all convicted impaired drivers in Alberta are required to attend the course as a condition of licence reinstatement.

The programme was evaluated after the first eighteen months of operation (ie. July 1970 to December 1971) by Zelhart and Schurr (1975). Convicted impaired drivers were fined and automatically suspended from driving, then assigned by the courts to either (i) a three- to six-month probationary period during which they were required to attend the programme as a mandatory condition of probation, or (ii) a nonprobation control group. Assignment was left to the discretion of the judge, which presented some problems for programme evaluation. There was evidence that some judges tended to consistently assign drivers to the programme whereas others did not. Random assignment, therefore, was not possible. Some judges considered referral to the programme via a judicial probationary order an interference with their judicial prerogative, and often would not refer first offenders (Blumenthal, 1979). Furthermore, there appeared to be a tendency among some to assign those offenders with poorer driving records to the programme. During the period under study, 703 offenders had been assigned to the programme group and 657 had been assigned to the control group. There was no evidence of systematic bias in court assignment of offenders for the study sample, although some fluctuation was observed. Overall, it appeared that assignment to the programme was determined, in part, by the offender's history of serious traffic offences (ie. Criminl Code convictions). The two samples were similar in age (approximately 35 years), mean fines and suspensions. Offenders assigned to the programme had poorer driving histories than those in the control group as evidenced by more prior Criminal Code convictions for driving offences and impaired driving. There was no difference between the two groups in the distribution of prior Highway Traffic Act convictions or traffic accidents although accidents involving injury were more predominant among control group offenders. The driving records examined pertained only to the prior two years and thus do not represent the entire driving history of the offender.

Attendance at the programme was mandatory and a condition of probation. Failure, refusal or inability to attend or complete the programme was a breach of probation. Of those assigned to the programme during the sampling period, 13% failed to attend or complete the course. These offenders tended to be younger (mean age 31.2 years) and to have generally poorer driving records than those attending the course.

The evaluation design involved a comparison of programme participants and the control group on recidivism rates and driving behaviour subsequent to court assignment. The follow-up period was variable; driving records were examined for a minimum period of 24 months and a maximum period of 48 months. The outcome measures were impaired driving convictions, Highway Traffic Act convictions, driving-related Criminal Code convictions other than impaired driving, accident reports and treatment referral, analyzed by chi square tests and analysis of variance. Problems with the data source interfered with the sampling procedure and the subsequent measures of driving performance. For example not all individuals identified as charged with impaired driving could be verified in the Department of Highways files of driving records. Among those correctly identified, information was unavailable for some drivers due to unreadable forms used as the source of information, and there were a substantial number of cases with incomplete information.

The evaluation indicated that the programme did have a positive effect on modifying driving behaviour, though not specifically drinking-driving behaviour (see Table 3). The programme group did not differ significantly from the control group on impaired driving recidivism during the follow-up period (17.1% and 16.6%, respectively). Within the programme group, those offenders who failed to attend or complete the course had a higher rate of impaired driving reconviction (19.6%) than those who completed the programme (16.7%). Significant programme effects were observed, however, on other measures of traffic violation. Offenders attending the programme were less likely to be convicted of a Criminal Code driving offence other than impaired driving during the follow-up period (5.7%) than the control group (8.9%), and offenders assigned to the programme but not attending were most likely to have such a conviction (19.6%); the differences were significant ($p<.001$). Similarly, programme participants who completed the course were less likely to be convicted of a Highway Traffic Act offence during the follow-up period (37.1%) than the control group (40.2%), and the programme non-attending group were most likely (44.6%), but the difference between the three groups did not reach statistical significance. However, the mean frequency of subsequent H.T.A. convictions among the programme participant group (mean=0.63) was significantly lower ($p<.05$) than that of the control group (mean=0.75). There was no statistically significant difference between groups in the incidence of traffic accidents during the follow-up period, nor in the mean frequency of accidents; approximately one-third of each group were involved in an accident.

One of the major roles of the programme was to screen and refer participants to auxillary services for driving and/or alcohol problems. Within six months of conviction, almost twice as many programme participants (10.7%) as controls (6.3%) made an appearance at the most commonly used treatment centre. This appearance rate among programme participants represented 38% of referrals made, thus a 38% successful referral rate. The authors concluded that this finding provided evidence for the programme as an effective referral service for individuals with alcohol problems. However, the referral rate for the control group was not reported, so it is difficult to assess whether the programme was more successful in referring to treatment than other modes of referral.

In summary, the initial evaluation of the Alberta Impaired Drivers' Programme indicated that four weekly educational sessions had a general impact on traffic violations but not specifically on impaired driving. The data revealed no evidence of a significant reduction in impaired driving recidivism among persons entering the rehabilitation system. However, drivers completing the programme had significantly lower rates of traffic violations and Criminal Code convictions other than impaired driving. Given that those offenders assigned to the programme tended to have poorer driving records in general than those assigned to the control group, the finding that impaired driving recidivism rates were similar for both at follow-up may be a positive indication of programme effectiveness. The evaluation was limited by several methodological problems: lack of random assignment to either the programme or control group, uncontrolled differences in the driving histories of the two groups, variable follow-up intervals, programme drop-outs, and incomplete data source.

The short-term impact of the modified programme (ie. one day course) on knowledge and attitude levels of participants was evaluated by Davidson (1983). The study sample was comprised of registrants of course sessions selected for inclusion in the study. All convicted impaired drivers in Alberta are required to attend the course as a condition of licence reinstatement. However, it is the offenders' responsibility to register for the course. The study sample tended to be male, under the age of 30 years and not highly educated. During the prior year, 40% consumed alcohol on the average four or more days a week, and 18% usually drank before noon at least two days a week. Almost one-third (31%) had lost a friend due to drinking and 9% had lost a job as a result of drinking. Over half (55%) reported occasions of impaired driving at least once a month, and one quarter at least once a week. About one-quarter (23%) had attended the course previously. Almost half of those who took a breathalyzer test at the time of the criterion arrest registered a BAC over 150 mg.%.

The evaluation method involved administering a pre-course questionnaire by telephone during the week prior to the session, an in-class questionnaire at the completion of the day-long session, and a post-course questionnaire by telephone approximately one week after each session. The pre- and post-intervention questionnaires were the same in content, and queried the following: knowledge of alcohol equivalencies, alcohol metabolism, Criminal Code offence and penalties, licence reinstatement, alcohol involvement in traffic accidents, and consequences of conviction; attitudes about the criterion conviction, future drinking-driving behaviour, reasons for not driving impaired, impaired driving as a criminal offence, impaired drivers, and spot-checks. The in-class questionnaire included questions on the frequency of impaired driving during the year prior to the criterion conviction, BAC reading for criterion conviction and accident involvement, symptoms of problem drinking such as loss of job or friends related to drinking and self-perceived alcohol problem, frequency of drinking, change in attitude toward drinking and driving as a result of criterion conviction, and opinions of course and course content. Information obtained from the in-class questionnaire was used to describe the background characteristics of the study sample with regard to drinking habits and driving habits, and to provide programme feedback.

Responses prior to the course were compared with those obtained within a week of completion of the course (Table 3). Differences were not tested for statistical significance. The sample size and completion rate were not reported. Comparison of the knowledge items indicated a general increase in knowledge from pre- to post-intervention. Before the course, respondents were quite knowledgeable about the effects of alcohol on the body (eg. 73% responded that coffee does not make a person less drunk and 60% responded that a shower doesn't either, and 82% estimated closely or underestimated their alcohol consumption for attaining BAC of 80 mg.%). Respondents were less aware of the alcohol content of different beverages (44% knew which was stronger, beer or whiskey) or alcohol metabolism (43% knew that alcohol was broken down in the liver). Almost all knew that the legal consequences of an impaired driving offence included a criminal record (94%), an increase in insurance rates (90%) and restricted entry to the U.S. (68%). A smaller majority were cognizant of impaired driving as a Criminal Code offence (55%) and the procedures for licence reinstatement (58%), and few knew that they didn't lose demerit points (19%) or the length of licence suspension (35%). A substantial number (59%) were correctly aware of the rate of alcohol involvement in traffic fatalities. After the course, the majority of respondents correctly answered all knowledge items with the exception of the length of licence suspension (only 46% responded correctly).

Most attitude items also increased in a positive direction at post-test from pre-test, although the impact was not of the same magnitude as that observed for knowledge levels as a large majority of respondents expressed favourable attitudes to most items prior to the intervention. For example, 87% at pre-test and 92% at post-test thought impaired driving should be a criminal offence, and 98% at pre-test and 99% at post-test thought impaired driving increases the risk of accidents. There was no change regarding the statement that impaired drivers drink too much for their own good (71% positive at pre-test, 70% at post-test), and just about half thought impaired drivers were irresponsible in other ways too (44% at pre-test and 51% at post-test).

Although the evaluation did not include behavioural measures, respondents were queried about **intended** drinking-driving behaviour. Little change in expected behaviour was observed. Before the course, 87% intended to reduce greatly or to eliminate drinking and driving while at post-test 85% expressed these intentions. Similarly, means for avoiding impaired driving did not change as a result of the intervention; the majority intended to avoid driving after drinking (74%) rather than drinking less (18%).

In summary, the modified Alberta Impaired Drivers' Programme demonstrated at least a short-term improvement in offenders' knowledge and attitudes towards impaired driving topics through a one-day educational course. The changes from pre- to post-intervention were not, however, tested for statistical significance.

4.1.2. North Bay Impaired Drivers Programme

The North Bay, Ontario, impaired driver education programme was first implemented in November 1973 and underwent a number of revisions over the following year (Poudrier et al., 1975). The purpose of the programme was to rehabilitate the impaired driver through a comprehensive education curriculum and individual therapy over the course of twelve weeks. The objectives were to assist the impaired driver in effecting an attitude change toward drinking and driving which would result in a reduction of recidivism of alcohol-related driving offences, assist the problem driver in identifying and understanding his problem, and to ensure that the problem drinker was aware of alcohol treatment resources available and means for problem management. Drivers convicted of a second or subsequent impaired driving offence in North Bay comprised the target population.

Recidivists were assigned to the programme by the courts upon sentencing as a mandatory condition of probation. There were no provisions for a non-programme control group until two years subsequent to the implementation of the programme, when a change in policy allowed for a control group of convicted second offenders, although assignment to the control group was restricted to only 25% of the recidivist population. An attempt was made, however, to make the assignments random. The programme participants and non-programme controls were administered an instrument battery at the beginning and end of the course, including eleven attitudinal concepts rated on a semantic differential. Comparisons were made of attitude changes over the course of the programme among 100 programme participants and 41 recidivists assigned to the control group. The programme components included eleven weekly two-hour group educational sessions (averaging 9-15 participants) encompassing the health, psychological and sociological aspects of drinking and drinking-driving behaviour, events leading to the criterion arrest for impaired driving, consequences of drinking and driving, and prevention of further offences. One individual therapy session was conducted to examine the individual's alcohol problems. The course was operated by resource people. The judge instructed the participants directly that subsequent conviction would result in a minimum sentence of three months in jail.

Pre-and post-comparisons of the programme and control groups using a repeated measures analysis of variance found few attitude measures changed over the course of the programme (Poudrier, 1978). Only two concepts showed a significant interaction effect: recidivists attending the programme had a more positive attitude towards the programme and a more negative attitude towards drinking and driving at the post-test than the pre-test, whereas the reverse was observed for the control group (see Table 3). This finding represented an immediate effect of the programme; the long-term impact was not investigated.

A second comparison was made using a different control group, to determine whether or not convicted impaired drivers would recidivate less after attending the education programme than impaired drivers subjected to the routine punishment directed by the courts. The control group in this case was a random sample of impaired drivers from Thunder Bay, Ontario, convicted on a second or subsequent offence within a three-year period corresponding to the first three years of operation of the programme, selected from the records of the Ontario Ministry of Transportation and Communications. Thunder Bay was considered a suitable control because it was geographically removed from North Bay to prevent overlap effect from the programme, the population was large enough to permit random sampling, the cities were politically and economically similar and had comparable impaired driving rates. For comparisons, the programme sample was comprised of 150 offenders and the control sample numbered 143. The two groups were similar on sex and age distributions. Recidivism rates over a four-year period were compared (see Table 3). Data were derived from driving records provided by the Ministry of Transport and Communciations. A significantly lower recidivism rate was reported for the programme participants (16.0%) than the controls (32.9%). The author concluded that the programme was effective in reducing the likelihood of recidivism among multiple offenders. Evaluation of the outcome should take several methodological shortcomings into consideration. For example, it is questionable whether or not the control group was appropriate, in that part-way through the sampling period the policy on sentencing of multiple offenders in Ontario changed so that thereafter a minimum fourteen-day jail term was mandatory upon a second impaired driving conviction. However, the North Bay jurisdiction was exempt from this policy. The outcome results did not take this policy change into consideration. Secondly, follow-up periods were variable with no control for variation in driving exposure, so that those convicted at the beginning of the follow-up period had a longer time to commit an offence than those convicted near the end.

In summary, the North Bay rehabilitation programme was effective in changing some attitudes towards drinking and driving although the longevity of this change was not investigated, and the research design employed posed problems. This programme was different from others reviewed in that individual therapy was a component of the course in addition to educational content. As with many programmes, initial problems of sobriety and hostility among participants were reported.

4.1.3. **Oshawa Impaired Drivers Programme**

The Oshawa Impaired Drivers Programme was patterned after the Phoenix and Alberta programmes, with the following objectives: to educate the drinking driver and develop a responsible attitude towards drinking and driving, effect a reduction in recidivism for impaired driving, and refer those with an alcohol problem to a treatment resource. The target population was second and subsequent convicted impaired drivers in the Durham Region, Ontario. The programme consisted of nine weekly two-and-one-half-hour educational sessions conducted by resource people. Programme content included the effects of alcohol and drugs on driving performance, knowledge about drinking-driving laws, stress-coping skills, defense mechanisms, alternatives to drinking and driving, and self-evaluation of drinking-driving behaviour.

The programme, commencing November 1974, received drivers convicted of a second impaired driving offence. Two years later the programme design was changed for evaluation purposes. All convicted second offenders served the standard minimum fourteen-day jail term and were placed on an eighteen-month probation at which time they were randomly assigned to either the education programme or a non-programme control group. For those assigned to the programme, participation was a mandatory condition of probation. A preliminary evaluation of the programme found that the majority were unwilling participants and would not attend if it were not for the court order (Ennis, 1977).

The evaluation designed was experimental, and consisted of 131 offenders randomly assigned to either the programme group (N=70) or the non-programme control group (n=61). The sample was characterized as mainly male, 35 years of age, not currently married, employed, with incomplete high school education, and Protestant. The general frequency of drinking was low, as was self-perception as a problem drinker and previous treatment for alcohol problems, although diagnostic instruments identified the majority as problem drinkers.

The programme and control groups were compared on change in knowledge and attitudes over the course of the programme, and recidivism rates over a forty-four month follow-up period (Vingilis et al., 1981). Data were derived from an eighteen-item knowledge test and a twenty-item drinking-driving opinion survey[10] completed before and after each course, and from driving records. Although treatment referral was an objective of the programme, this measure was not evaluated.

The results of the pre-test/post-test comparisons are presented in Table 3. A significant increase in knowledge levels was observed among the programme participants over the course of the nine-week sessions, but not among the controls. A comparison of means using the Tukey HSD procedure demonstrated that mean knowledge scores for the programme group at post-test (mean score = 12.03) were significantly higher than at pre-test (mean score = 10.14), whereas mean scores for the control group at post-test (mean score = 10.31) were not significantly different from scores at pre-test (mean score = 9.92). No programme effect on attitudes towards drinking and driving was evident; an increase in responsible attitudes on this measure from the pre-test to the post-test was observed for both the programme and control groups. Similarly, there was no evidence of a programme effect on traffic safety measures. Using survival rate analysis and analysis of covariance, no significant differences were found between the two groups on recidivism rates, number of alcohol-related convictions, number of serious traffic offence convictions[11] or total number of convictions.

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[10] developed by: Stewart, E.I. and Malfetti, J.L. Rehabilitation of the Drunken Driver: A Corrective Course in Phoenix, Arizona for Persons Convicted of Driving under the Influence of Alcohol. New York: Columbia University Teachers College Press, 1970.

These findings would indicate that the Oshawa programme had little rehabilitative impact on multiple drinking-driving offenders. A programme effect on the cognitive measure was observed, but the long-term impact on knowledge gain was not examined. There was no demonstrable immediate impact on attitudes, nor long-term effect on drinking-driving behaviour. The authors suggest several reasons for the lack of impact on traffic safety measures: hostility of participants toward the programme resulting from coercion involved in attending (similar problems of resentment were reported in accounts of other rehabilitation programmes, for example the North Bay and Alberta programmes); the programme components may have been inappropriate for the participants as effective rehabilitative modalities; and the criteria measures for evaluating effectiveness may have been inappropriate.

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11. defined as (a) driving without a licence; (b) speeding; (c) careless driving; (d) fail to remain; (e) disobey police signal; (f) poor driving record; (g) driving while disqualified; (h) fail to report an accident; (i) disobey traffic signal; (j) dangerous driving; (k) passing within 30 m. of crosswalk.

4.1.4. Chatham Drinking-Driving Awareness Programme

The Chatham Drinking-Driving Awareness Programme was implemented in February 1978 in Kent County, Ontario, as an education programme aimed at preventing the recurrence of impaired driving offences among those first offenders who attend the programme. The programme consisted of one three-hour session per week for a total of four weeks. Participants entered the monthly programme subsequent to conviction. Average group size was eleven. Course curriculum was developed on the basis of five working assumptions which stated, briefly, that both drinking and driving are social roles, and that the impaired driver is essentially an irresponsible role performer and can be resocialized through an education programme designed on the concepts of knowledge, ability and motivation as the factors leading to responsible role performance. Course content involved knowledge of drinking-driving laws, influence of alcohol on the body and on driving performance, events leading up to the impaired driving arrest, alternate strategies to drinking and driving and benefits of not drinking and driving.

The evaluation design was quasi-experimental. All impaired driving first offenders convicted in the Chatham Court were eligible to participate in the programme. The programme group consisted of those first offenders who volunteered to enter the programme. Programme participants were allowed a reduced fine. Programme participants were also put on a three-month probation, and failure to complete the four-week course was considered a violation of probation with additional consequences. Two control groups were defined. The remaining first offenders who elected not to participate in the programme comprised one control group. This group was subject to a heavier fine than the programme group. A second control group consisted of multiple impaired driving offenders.

The programme was publicized locally through media releases to the newspapers and television station. Also, drivers charged with an alcohol-related offence were made aware of the programme through legal counsel and descriptive pamphlets distributed on the court premises.

Background characteristics available only for programme participants attending during the first six months of operation were as follows: typically male, aged 29 years, not currently married, with incomplete high school education, employed and earning in the middle-income range, with 40% at risk for health damage due to drinking. At the time of arrest, just under one-third had been involved in an accident, and the average BAC was 180 mg%.

The programme was evaluated after one year of operation (Markle et al., 1980). The samples consisted of 129 first offenders entering the programme representing 37% of all first offenders, 252 first offenders in the non-programme control group and 115 repeat offenders. Outcome data were collected for all three groups at one same point in time, approximately four months subsequent to the completion of the last course conducted in the sampling period. Data were derived from two sources: court records and an anonymous five-item self-report questionnaire measuring the incidence of drinking and driving, frequency of drinking and driving, probability of arrest for impaired driving, and personal costs of impaired driving convictions. The three groups were compared on recidivism of impaired driving convictions and the self-reported drinking-driving measures (see Table 3). Observed differences were not tested for statistical significance.

Examination of subsequent impaired driving convictions for each of the three groups indicated that a larger proportion of first offenders who elected to attend the programme were re-convicted during the follow-up period (3.9%) than those who did not attend the programme (1.6%), and that the recidivism rate of the programme sample was similar to that of the repeat offender sample (4.4%). Because reconviction data were obtained from Kent County Court records and pertained only to subsequent offences committed and tried in the Kent County jurisdiction, the outcome evaluation was examined for bias against Kent County residents. County residency was found to be a factor in whether or not a first offender chose to enter the programme; a larger proportion of participants (94%) than non-participants (69%) resided in Kent County. When residency was controlled for, programme participants were still found to have a higher recidivism rate (4.1%) than the control group (2.3%). These findings were limited by incomplete driving records as a result of using only Chatham court records as the data source. Re-arrest data may have been under-represented for those living outside the court's jurisdiction. The overall return rate of the self-report questionnaire was low (23%), making interpretation of the data questionable. The returned data indicated that self-report of subsequent convictions was consistent with that derived from court records, and that there was no difference between the three groups in self-reported incidence of other drinking-driving behaviours.

The major methodological problem with the programme assessment was the absence of random assignment to the programme and control groups, thereby confounding programme effects with group effects. Also, because background information was available only for programme participants, differences in sample characteristics could not be controlled for in the analyses. A second limitation was in design measurement. Given the low probability of a reconviction and the relatively small number of programme participants within the sampling period and the short follow-up interval, the adequacy of outcome data may not have permitted testing for statistical significance of effectiveness. A third limitation involved lack of control for differences in follow-up intervals. Because recidivism data were collected at one point in time only, early cohorts would have a greater opportunity to commit an offence than would later cohorts.

On the positive side, the policy of voluntary participation eliminated some of the problems associated with implementation reported in other programme accounts, and offenders were provided with a reduced fine as an incentive to participate. The attendance rate as reported in a preliminary evaluation was high (Markle et al., 1978).

4.1.5. British Columbia Impaired Driver's Course Programme

The Impaired Driver's Course Programme of British Columbia was implemented in communities throughout the province. The number of courses per year varied within each community depending on the population size. Two studies assessing the efficacy of the programme are presented.

Many communities integrated their programme into the court system as a form of penal sanction. In Nanaimo, convicted impaired drivers were assigned to the course as a condition of probation. Evaluation of the Nanaimo programme was essentially exploratory and an attempt to measure changes in attitudes towards drinking-driving among programme participants (Edelman et al., 1977). Briefly, 138 convicted impaired drivers who had completed the course within a nine-month sampling period, and a comparison group of 150 local pub patrons were administered a questionnaire eliciting attitudes towards the programme and on drinking habits. The return rate for the programme paticipants was low, approximately 51%; the return rate for the comparison group was not specified. The results of the comparison between the two groups indicated that the programme participants were significantly more conservative in their judgement of ability to drive after drinking, more aware of the dangers associated with drinking and driving, and significantly more knowledgeable about alcohol involvement in accidents than the comparison group. Recidivism of impaired driving was not adequately examined. Just over 1% of those who completed the course were reconvicted, but the follow-up period for recidivism was not specified, nor was the recidivism rate of non-participants known. The study was limited by use of an inappropriate comparison group, a poorly designed and administered measurement instrument, low response rate, inadequate outcome measures and the absence of a pre-test. The evaluation was essentially exploratory in nature, unable to offer conclusive evidence of programme effectiveness.

Pocock and Goldberg (1976) examined impaired driving recidivism rates as part of an overall review and critique of the programme operating in the lower mainland of British Columbia. A sample of 30 convicted impaired drivers who attended an Impaired Driver's Course were compared with a control group of 30 randomly selected impaired drivers who did not attend the programme. The sampling period was a one-month interval in 1975. The jurisdiction was Richmond. A comparison of impaired driving convictions from one-year court record follow-up data, using time series analyses, indicated that the recidivism rate of programme participants was significantly lower than that of non-participants. The evaluation was criticized for the following methodological shortcomings (Edelman et al., 1977): non-random assignment to the programme by the courts, limited sample size, programme and control samples matched only on conviction for impaired driving with no control for other variables, and problems with the analysis procedures.

4.1.6. Newfoundland Impaired Drivers' Programme

An educational programme for persons convicted of impaired driving is offered in several centres in Newfoundland. The programme was first implemented in 1978. The programme development was based on the Alberta Impaired Driving Programme. During the first two years of operation, the programme consisted of eight two-hour sessions, the first four assigned to providing information and the latter four to discussion and self-evaluation. After 1980, the programme was modified substantially to one eight-hour session in an attempt to increase administrative efficiency with respect to resource personnel, participant attendence, course content and duration. Course content included presentations on aspects of impaired driving by police, judiciary, motor vehicle registry and automobile insurance industry representatives; information provided by the Alcohol and Drug Dependency Commission, a co-sponsor of the programme; and discussion and self-examination pertaining to problem drinking.

The objectives of the programme were: (1) to make the convicted impaired driver more cognizant of the social, physical, financial and legal ramifications of drinking and driving, and to effect a personal change in attitude toward impaired driving; (2) identify and refer to treatment alcohol dependent persons, and (3) increase public awareness of the impaired driving problem, to develop a better understanding, involvement in and support for countermeasure efforts. Convicted impaired drivers were referred to the programme by provincial court judges, at the judges' discretion. Compliance was enforced through a probation order.

The programme was evaluated for the period 1979-1981 (Cake and Cooper, unpublished). Convicted offenders who completed the programme were compared with a comparable group who were not referred to the programme on impaired driving convictions and traffic accidents for a two-year period prior to licence suspension and a two-year period after licence reinstatement (Table 3). The experimental group consisted of 101 offenders who completed the Impaired Drivers Programme in St. John's as a result of convictions recorded from 1979 to 1981. The control group consisted of 101 convicted residents of the St. John's CMA who were quasi-randomly selected from Motor Vehicle Registration files, i.e. the control group was selected to match the experimental group as a whole on the variables of age, category, number of DWI convictions during the past two years, residence (St. John's CMA) and year of conviction.

Programme participants were characterized as being mostly male (99%), from urban communities (98%), younger than 40 years of age (74%) and half under 30 years of age, and either married/common-law (47%) or single status (38%). Half of the participants had grade 9 or less education and a further third (32%) had partial or complete high school education. More than half (52%) were unemployed when they were referred to the programme. A crude measure of alcohol problems indicated that 35% were problem drinkers. Approximately one-quarter of the participants were first offenders. Upon sentencing of the criterion conviction, the large majority (76%) were given jail terms, while the remainder were given fines additional to or as an option to jail terms. The average length of the mandatory probation period was 17.5 months. Compared with DWI offenders in general in the province, programme participants were more likely to be separated or divorced from their spouse, less educated reside in urban communities and to be unemployed.

The dependent variables were recidivism and accidents following licence reinstatement, recorded at six month intervals for a period of up to forty-two months. Using chi square analysis, the reconviction rate of programme participants was not significantly different from that of the control group; 38% of the programme group were reconvicted during the two-year follow-up period compared with 29% of the control group. Furthermore, both groups showed almost the same reduction in average number of convictions during the post-intervention period from the pre-intervention period; the average number of convictions declined from 1.8 to 0.54 for the programme group, and from 1.8 to 0.55 for the control group. Using survival rate analysis, the two groups were compared for a possible effect of the programme on delaying recidivist behaviour. The results indicated no significant difference between the two groups in the proportion not reconvicted of a DWI offence at each six-month interval over the two-year follow-up period. During the initial period of licence suspension, fewer programme participants than controls were rearrested for a DWI offence. Six months after licence reinstatement both groups had comparable rates of recidivism. After six months, recidivism was greater for the programme group. No long-term programme effect on recidivism was observed. The findings suggest that at least during the intital post-conviction period when licences were under suspension either the programme or the accompanying probation period or both functioned to reduce impaired driving arrests among participants as evidenced by a higher rearrest rate among controls than programme participants. The difference did not, however, reach statistical significance. It is not known whether participants contrary to controls abstained from driving while under suspension or adopted safer driving behaviour to avoid detection while under suspension.

Subgroups of the programme and control groups based on age, type of offender, length of probation and length of jail term were examined for differences in recidivsim rates. Younger offenders (ie. less than 30 years) completing the programme were significantly more likely to recidivate than their control counterparts (42% compared with 29%), whereas the difference observed among older offenders was not significant (33% compared with 27%). First offenders in the programme group had a lower rate of recidivism than those in the control group (19% compared with 23%) but the difference was not significant. Repeated offenders in both groups had comparable rearrest rates (44% in the programme group compared with 43% in the control group). Information pertaining to length of probation period and jail sentence was available only for the programme group. Though none of the differences reached statistical significance, recidivism among programme participants tended to be positively related to length of probation and negatively related to length of jail sentence.

Traffic accident involvement was recorded for a period of up to two years before and two years after completion of the Impaired Drivers' Programme and comparable measures were obtained for the control group. The programme group evidenced a reduction in accident involvement during the post-intervention period (19%) compared with the pre-intervention period (27%) whereas no change was observed among the control group (17% and 17%, respectively).

In summary, the Impaired Drivers' Programme in Newfoundland was found to have little impact on reducing impaired driving recidivism, but a positive effect on accident involvement. The authors speculate that although the programme may not influence the likelihood of drinking-driving behaviour, it may in fact contribute to lower levels of impairment which in turn may account for the lower accident rate among programme participants during the post-intervention period. Unfortunately there was no BAC data available to investigate this hypothesis. The authors attribute the lack of programme impact on recidivism rates to a lack of consistency in programme presentation during the period under evaluation, and also to possible uncontrolled for differences in background characteristics between the programme and control groups. For example, sample variation on degree of alcohol dependency was suggested as contributing to observed differences in impaired driving rates independent of programme participation.

4.2. **Summary**

Six Canadian rehabilitation programmes for convicted impaired drivers were reviewed. Of these, two employed an experimental evaluation design with random assignment to programme participation or non-programme control group (Oshawa and North Bay - in the latter case, assignment to the control group was restricted to 25% of offenders convicted), and four had a quasi-experimental evaluation design (Alberta, Chatham, British Columbia and Newfoundland). Only one programme was targeted to first offenders specifically (Chatham), and two were targeted to multiple offenders specifically (North Bay and Oshawa). All offenders were eligible for the remaining programmes. Assignment to the programme was voluntary only for one programme (Chatham). For the remaining, excepting Oshawa, assignment to the programme was at the discretion of the courts, and in all cases participation was a mandatory condition of probation whereby failure to attend was a breach of probation with the attendant consequences (this aspect was not clear for the British Columbia programme).

Programme duration varied from a one-day session to twelve weekly sessions. Programme components were mainly educational, and only one included an individual therapy component (North Bay). Course content was similar for all programmes and covered topics such as the influence of alcohol on the body and driving performance, drinking-driving laws and penalties, consequences of impaired driving (eg. insurance, licencing, etc.), attitudes toward drinking and driving and current laws, problem management, and alternatives to drinking and driving. The objectives of the programmes were basically the same, to effect a change in attitudes toward drinking and driving and to reduce recidivism of impaired driving. Programme completion rate was reported for only one programme (Alberta - 87%). Available sample characteristics indicated that first offenders were on the average younger and had fewer serious alcohol problems than multiple offenders.

Follow-up periods ranged from eighteen months to four years subsequent to implementation of the programme (interval unknown for British Columbia programme evaluations). Follow-up intervals were generally variable. All programmes stressed knowledge and attitude change as the objectives of the course content. Four included an outcome measure of attitude change in the evaluation (Alberta, North Bay, Oshawa and British Columbia), and three included a measure of knowledge change (Alberta, Oshawa and British Columbia). Attitude and knowledge change were usually assessed by a self-report questionnaire. Traffic safety measures were employed in all programme evaluations, although in half the evaluations measures were restricted to recidivism of impaired driving and did not include other traffic violations. The data sources most frequently used to assess traffic safety measures were driving records or court records of convictions. Self-report drinking-driving data were used in only one evaluation. A measure of successful referral to a treatment resource was included in one evaluation (Alberta).

The overall results of the evaluations (some non-statistical) indicated that positive changes in knowledge, attitude and traffic safety measures were observed. Of the three programmes evidencing knowledge change (Alberta, Oshawa and British Columbia), all reported an increase among programme participants. Of the four assessed for attitude change, a positive programme impact was reported for three (Alberta, North Bay and British Columbia). No significant treatment effect on the attitude measure was found for the Oshawa programme. The programme impact on traffic safety measures was demonstrated to be positive for four programmes (Alberta, North Bay, British Columbia and Newfoundland), of little consequence for one (Oshawa) and negative for another (Chatham).

The implementation and evalution of the rehabilitation programmes appeared to be limited by several methodological and design shortcomings. For example, the following: (i) random assignment of convicted offenders to a programme was often impossible due to ethical conflicts of the courts. Even when a policy of random assignment was agreed upon, judges were often found to be making exceptions and using their own discretion; (ii) attendance at most programmes was a mandatory condition of probation. Policing offenders who ignored their probation order was difficult for several reasons inherent to the system of probation orders. For example, probation officers were found to be reluctant to enforce the order because they rarely considered impaired drivers "criminal" compared with other offenders under their jurisdiction; regular reporting to a probation officer was not a requirement so it was often an arduous task to locate a programme drop-out for retribution; and judges often discouraged court time being taken up with breach of probation orders because of heavy case loads (Blumenthal, 1979). Programme participants were often reported to be resentful of their assignment to the programme, and would arrive intoxicated and hostile, a frame of mind not paticularly conducive to attitude and behaviour modification; (iii) programmes with multiple offenders as the target population may show little impact on outcome measures possibly because participants most likely have serious alcohol problems requiring more intensive and/or extensive treatment than can be provided for in an educational programme. There is some evidence from the rehabilitation literature that a programme of solely alcohol education does not reduce the recidivism rate of the problem drinker/repeat offender (Horwitz et al., 1981); (iv) although most programme content focussed on knowledge about and attitudes towards drinking-driving issues, not all included measures of these in the programme evaluation; (v) few evaluations included traffic violations other than impaired driving as evidence of an improvement in driving; (vi) the data source was often incomplete (eg. the use of court records rather than driving records restricted the data to convictions within the court's jurisdiction); (vii) few evaluations compared the background characteristics of programme participants with the controls, thus possibly confounding treatment effects with group effects.

The Impaired Drivers' Programme in Newfoundland, like many educational rehabilitative programmes for convicted impaired drivers, had a limited impact on impaired driving behaviour. The evaluators of the programme raised the following considerations which, if implemented, may overcome many of the problems associated with rehabilitative programmes to date: (i) programmes should be designed so as to provide different approaches for subtypes of impaired driving offenders, for example, courses targeted specifically to problem drinkers versus non-problem drinkers; (ii) provisions should be made to refer programme participants identified as problem drinkers to post-programme treatment; (iii) legislation specifying that the completion of an impaired drivers course is required as a condition of licence reinstatement for all impaired driving offenders would be more effective in recruiting offenders into appropriate rehabilitative programmes than relying on the discretion of the courts to make referrals; and (iv) programmes should incorporate an evaluation component into the programme design.

Rehabilitatin programmes have been implemented in other jurisdictions, but not subject to evaluation. For example, an impaired drivers programme is in operation in several communities throughout the Yukon. Lectures and films are used to educate offenders about the consequences of drinking and driving. The focus is education, not therapy. The course also provides a referral service for participants with drinking problems (Hursh, 1980). A Second Offenders Programme has been in operation in parts of Manitoba for a year and will be expanded throughout the province in late 1984. The programme is mandatory for all drivers convicted of a second offence of impaired driving as a condition of licence reinstatement. The programme is designed to educate and rehabilitate the impaired driver and to assess problem drinking. A similar programme for first offenders is planned to commence in the fall of 1984 (The Journal, 1984).

5. TECHNOLOGICAL APPROACH

Technological developments have been applied to interdict the sequence of events leading to drinking and driving. The application has usually been in conjunction with other countermeasure approaches, such as the use of breath-testing equipment with enforcement activity to support legislative changes. In Canada there have been two documented demonstrations of the applicability to traffic safety of two separate technological devices: public breath-testing and videotaped evidence.

5.1. Tavern Breath-testing

5.1.1. British Columbia Experiment

A trial of public breath-testing in drinking establishments as an effective countermeasure to reduce impaired driving was introduced in Vancouver, British Columbia in late 1976 (Calvert-Boyanowsky and Boyanowsky, no date). The intent of the experiment was to observe whether or not individuals who intended to drive after drinking but learned as a result of a breath test that they were legally impaired would change their intentions and find other means of transportation. The following objectives were addressed; (i) to determine the rate of utilization of public breath-testing equipment; (ii) to determine the users of such equipment, and whether or not drivers who think they are legally impaired avoid the breath test; (iii) to examine the effect of repeated exposures to breath-testing in a public setting on an individual's ability to estimate accurately his BAC; (iv) to examine the impact of knowledge of BAC level on decision to drive on the specific occasion of testing, and on the mode of travel or quantity consumed on future drinking occasions.

Testing was conducted in six public establishments serving alcohol beverages in the Greater Vancouver area. The locations represented different types of liquor licences, and included two pubs, two lounges featuring musical entertainment of which one was frequented most by students, and two restaurant-lounges. Testing was conducted during the months of November, December and January by two teams of researchers who worked in each of the locations for four hours per night, six nights per week for a total of six weeks. The first three weeks constituted the **pre-breath-testing period.** During this phase a random sample of patrons (15-20 per location per evening) were approached and asked to complete a drinking survey questionnaire. The last three weeks constituted the **breath-testing period**. A unit was installed in each location and any patron who expressed an interest in it was invited to fill out a questionnaire. Prior to taking the breath test, respondents were presented with a communication detailing the legal implications of impaired driving and disclaiming guarantees of accuracy of the breath-testing machine used in the study, a measure taken to avoid possible criminal and civil liability.

The researchers recorded information on refusals and atmosphere characteristics of the locations. The refusal rate was approximately four per location per night, and considered too low for meaningful analysis. Subjective assessment of the location's density, illumination, traffic level, noise level, rowdiness, mobility and source of music indicated that there was little change on these ratings over the study period.

The questionnaire had been pre-tested, and included age, sex and occupation information, and twelve items describing usual tavern drinking habits (eg. consumption per hour, length of stay, frequency of tavern-going) and the specifics of the particular drinking occasion (eg. mode of transportation to and intended mode of transportation from the establishment, length of time in location, consumption, self-perceived estimate of their BAC, and distance from location to home). The researcher also recorded the time, date, location, whether the respondent was solicited or a volunteer, and the breath test reading during the breath-testing phase. An identification code was self-generated by the respondents to permit identification of those who were surveyed on more than one occasion.

The outcome measure was incidence of impaired driving upon departure from the tavern. Two methods were used to measure outcome. The first involved a stamped, addressed postcard distributed to each respondent upon completion of the questionnaire in the pre-breath-testing phase, and upon administration of the breath test in the breath-testing phase. The postcard indicated the date, location, and the respondent's self-generated identification code. The postcard was to be completed and mailed the day following the survey, recording whether or not the respondent had gone directly home after the survey and mode of transportation used. Return rate of postcards was low: 33.4% of all respondents surveyed at least once. The second method involved direct surveillance by an observer of a random subsample of respondents as they left the locations (N=101) to determine their actual mode of transportation. None of this sample had returned a postcard. Outcome data were analyzed by analysis of variance and chi square tests.

A total of 3407 individuals completed questionnaires; the majority (60%) were surveyed only once. The sample was distributed fairly evenly across testing locations, and between the pre-breath-testing and breath-testing phases. A larger proportion of respondents were surveyed on Friday than other nights, and most between the hours of 10 and 11 p.m. The mean number of hours in the testing location was 2.4, the average number of drinks for the evening was 4. The sample tended to be male (66%), 19-25 years of age (60%), volunteers (63%), living within a 5-mile radius of the drinking location. Most frequented the testing location once a week, and taverns in general more often for an average stay of 3.3 hours consuming an average of 2.9 drinks.

On the night of the survey, the majority of respondents had arrived at the location by motor vehicle. Forty-four percent were drivers. Most respondents indicated that they intended to leave by motor vehicle, and most of the drivers intended to drive. In the pre-breath-testing phase, respondents were asked to estimate their blood alcohol level. The mean BAC estimate was 57 mg.%. One-third (32%) perceived themselves as being legally impaired (80 mg.% or greater). Self-perceived BAC levels were on the average lower than actual BAC levels as measured during the breath-testing phase, although the proportion of respondents estimating legal impairment was similar to the proportion actually impaired. The average measured BAC among those testing their breath sample was 65 mg.%, and 35% of the sample blew 80 mg.% or higher.

Forty percent of the sample were surveyed on at least two occasions. Compared with those surveyed only once, this sample tended to be more often male, younger, frequented taverns and the target tavern more frequently during the year, consumed more on the evening of testing and estimated a higher BAC level than the actual BAC reading in the breath-testing phase.

The results of the data analysis indicated that the majority of respondents did not appear to be deterred from driving by the knowledge that they were impaired. Those who were represented only a small proportion of impaired intended drivers (Table 4). Self-report outcome data (ie. returned postcards) indicated that 23% of intended drivers (ie. indicated prior to the breath test that they planned to drive after leaving the tavern) were actually impaired, and of these one-third (33%) changed their intentions and did not drive after acquiring knowledge of their actual BAC level. Comparison of the postcard data with the parking lot surveillance data, however, suggested that the figure of 33% deterred may be a substantial overestimate and that 11% was more likely. A larger proportion of intended drivers in the observer sample were impaired but a smaller proportion decided not to drive after learning that they were impaired (11%). The authors attributed the discrepancy to one of the samples being less representative of the total population. As the observer sample was randomly selected, it was considered to be a more reliable source of driver behaviour. However, in both instances, there was no **pre-breath test** data reported (ie. for the month of November) of the proportion of impaired drivers who intended to drive but upon leaving the testing location decided not to drive. Thus, it is impossible to judge even the limited impact of breath test knowledge on driving behaviour. It is possible that approximately 11% to 33% of impaired intended drivers change their intentions to drive after an evening in a public drinking place regardless of BAC feedback.

A plausible explanation for the observed lack of effect of this particular countermeasure may be attributed to the inconvenience of arranging an alternative mode of transportation on short notice, so that respondents drove in spite of the knowledge that they were impaired. The authors hypothesized that on subsequent drinking occasions such individuals might be expected to either reduce their alcohol consumption or plan in advance not to drive. To examine whether feedback of BAC level on one drinking occasion has any effect on the mode of travel or quantity consumed on future drinking occasions, the data were analyzed for the sample of respondents who had taken at least three breath tests. There was no evidence from the data that respondents were less likely to drive on subsequent occasions if their first BAC testing was high. Similarly, respondents who intended to drive did not reduce the quantity of alcohol consumed on successive testing trials. Also, the results were inconsistent with respect to the hypothesis that given repeated exposures to breath-testing in a public setting, people improve their ability to estimate their BAC.

Thus, in this demonstration of public breath-testing, only a **limited reduction** in impaired driving was observed. A secondary beneficial outcome of the countermeasure, suggested by the authors but not measured, may have been a more cautious attitude toward driving by impaired drivers who acquired the knowledge that they were impaired but drove a vehicle nevertheless. A critic of public breath-testing, Whitehead

(1975) contends that this approach might also serve to inform many individuals that they are less impaired than they thought they were and as a result lead them to consume more alcohol.

The outcome of this study should be interpreted cautiously as there were several methodological shortcomings. During the breath-testing phase in December, an active anti-drinking-driving campaign was in progress. The impact of the campaign on a patron's perception of likelihood of being stopped in a spot-check and therefore his intention or decision **not** to drive after drinking may have confounded the results. Secondly, the authors reported problems with the consistency of reliable readings from the breath-testing devices. More exact calibration was required. The method for gathering outcome data proved to be another source of bias. The validity of the self-report postcard method was examined by comparing actual drinking-driving behaviour, determined by direct surveillance of a subsample of surveyed subjects as they left the testing location, with self-reported behaviour as reported on returned postcards by this same subsample. The authors hypothesized that respondents might not readily admit that they had driven while intoxicated, and that subjects who had **not** broken the law would be most likely to return the postcards. Unfortunately, none of the subjects in the validity check returned a postcard, so the comparison could not be made. However, the discrepancy between the returned self-report postcard data and the observer data with respect to the proportion of impaired drivers who had originally intended to drive after the survey but changed their intentions after acquiring the knowledge of their BAC level (33% and 11%, respectively) suggest that respondents returning postcards were not representative of the total population. Secondly, the return rate for the postcard method was low; 33.4% for all respondents surveyed at least once.

5.2. Adjudication and Technology

5.2.1. Videotaped Sobriety Tests

A recent technological procedure was introduced to the adjudication process in a British Columbia community and evaluated (reported by Rockerbie, 1980). Sobriety test performance documented on videotape was introduced as a countermeasure in Vernon, British Columbia, in 1978 and evaluated for its usefulness as evidentiary material in court and as a deterrent to impaired driving. The procedure involved recording on videotape the offender's ability to perform four sobriety tests. The admissibility of the videotaped evidence was governed basically by the same principles applying to photographs and statements. A public awareness publicity campaign was conducted simultaneously with the introduction of the new measure, using local radio, television and press.

Results of the evaluation using chi square tests indicated that drinking-driving offences in the community of Vernon were significantly reduced (p>.05) during the six months after the introduction of the measure, compared with the six months prior to implementation (Table 4). Furthermore, a reduction from 30% to 18% in the number of charges contested in court was observed. Sampling procedures and sample size were not reported. No attempt was made to assess public awareness of the new measure, nor the impact of the publicity campaign.

The results indicated that this measure was effective in reducing impaired driving and court procedure time. However, no control group was included in the design therefore it is uncertain whether the reduction in impaired driving was a function of other factors (such as a possible overall decrease in the province). For example, midway through the evaluation period, the Ministry of Consumer Affairs introduced a saturation advertising campaign on television stressing alcohol moderation.

5.3. **Summary**

The provision of BAC feedback to drivers in public drinking establishments, either via breath-testing equipment or self-report consumption data interpreted by interviewers, is not a viable countermeasure to reduce impaired driving. The main drawback with this approach appears to be the inconvenience and/or expense of arranging alternative transportation. The results of the first demonstration of public BAC feedback reported in Canada (Calvert-Boyanowsky and Boyanowsky, no date) suggest that because drivers were informed of their BAC at the end of an evening of drinking, they drove away despite this knowledge because of the inconvenience of arranging alternative means of transport on such short notice. A later study (Nau and Van Houten, 1984) sought to overcome this problem by introducing a measure enabling patrons to regulate their drinking over the course of an evening, in order to avoid impairment in the first place. Little change in impairment was observed as a result of this intervention, however it is difficult to assess its usefulness as there was evidence that patrons were not utilizing the method in the correct manner. Nau and Van Houten (1984) also suggest that allowing a passenger to drive in lieu of the impaired driver is not as practical an option as first thought in light of their finding that passengers had BACs similar to those of drivers. Finally, other modes of transport, such as a taxi, were considered prohibitive.

Videotaped sobriety testing providing evidentiary material for use in court appears to be a possible countermeasure approach to deter impaired driving. This measure, however, has had limited testing under uncontrolled conditions.

6. SYSTEMS APPROACH

The systems-oriented approach refers to the methodical combination of two or more countermeasure approaches to effect a change in impaired driving. In Canada, system approaches have typically involved either a legislative change in drinking-driving laws to increase identification, apprehension and conviction of the drinking driver combined with a public information/education campaign to introduce the provisions of the legislation and alert the public to the changes in an attempt to raise the subjective perception of apprehension risk; or, a change in enforcement practices accompanied by a public information/ education campaign to make the public aware of the change and increase their subjective perception of apprehension risk. These approaches use primary and secondary intervention strategies to deter potential drinking drivers among the public at large and to apprehend drinking drivers who are already on the roads. In many examples of a system approach, a technological countermeasure has been employed as well, usually to support the legal component. Technological components are rarely isolated and evaluated for their contribution to the observed effect.

6.1. Legislation and a Public Information/Education Campaign

Implicit in the general deterrence model when applied to impaired driving is that the public will be aware of the laws that are being enforced and the penalties for noncompliance with those laws. In Canada there have been two demonstrations of a change in drinking-driving legislation accompanied by a public information/education campaign to provide drivers with the provisions of the new law and knowledge of drinking-driving issues.

6.1.1. **Breathalyzer and ".08" Legislation**

Federal legislation was introduced in 1969 to provide for compulsory breath-testing. The new law stipulated that refusal to take a breathalyzer test and driving with a BAC of greater than 80 mg% were both punishable offences. The intent of the legislation was to facilitate the identification, apprehension and conviction of the drinking driver by providing an objective measure of impairment, and the evidentiary use of a chemical test in the courts.

Prior to the proclamation of the Criminal Law Amendment Act 1968-69, which tabled changes to Sections 222-224 of the Criminal Code, the Federal Government undertook a mass media campaign to inform Canadian drivers of the amendments. The objective of the campaign was to convey to the public the provisions of the new legislation. There was no attempt made to influence attitudes towards drinking and driving. The target population was drivers throughout Canada. The campaign was implemented several weeks prior to the proclamation of the new laws in December 1969. The campaign was conducted through press conferences, television and radio commercials, posters, brochures and other materials. Independent of the campaign, both the press and the broadcast media gave extensive coverage of the new legislation in news reports, public affairs programmes, and special feature articles for several weeks after proclamation of the amendments.

The evaluation of campaign effectiveness consisted of a nation-wide telephone survey conducted in two waves: the pre-test was one week prior to the implementation of the Federal campaign, the post-test was ten weeks later. Telephone interviews were conducted in all provinces, in a total of 39 communities of various sizes with 1000 drivers in each wave. The respondents remained anonymous, but background characteristics describing age, sex, annual mileage driven, language, education, occupation and use of alcoholic beverages were recorded. The pre-test and post-test samples had highly similar profiles, and were considered representative of drivers throughout the country. The questionnaire included items related to the specific provisions of the new legislation, general information related to the changes, recollection of media through which this information was conveyed, and attitudes and opinions related to drinking and driving in general and to the new legislation. Statistical procedures used in the analyses were not reported.

The results of the evaluation, reported by Kates et al. (1970), indicated that the media campaign was successful in conveying general information about the amendments to the

Criminal Code and the specific provisions of the new legislation (Table 5). Significant increases in the proportion of respondents who correctly identified the following were found from the pre-test to the post-test: breath-testing as mandatory **throughout** Canada (13% and 49%, respectively); **80 mg.%** as the legal BAC limit for drivers (11% and 72%, respectively); **$1,000** as the maximum fine for the new offences (1% and 30%, respectively), although 90% of respondents in both the pre-test and post-test were aware that a fine was a possible penalty for impaired driving; **six months** as the maximum jail term (9% and 25%, respectively), although 74% in the pre-test and 83% in the post-test were aware that a prison term was a possible penalty; and the new laws as **federal** legislation (8% and 42%, respectively). Increases from the pre-test to the post-test were also observed in the proportion of respondents who were aware of the new legislation (50% and 83%, respectively) and the use of breath tests by police to determine whether a driver was impaired (71% and 91%, respectively). At post-test, only 10% of respondents were able to correctly specify at least one possible penalty for refusal to take a breath test, and 25% of those who were aware of new legislation could correctly recall the effective date as December 1, 1969. liability to blame Culpability for impaired driving was **not** successfully communicated. A decrease in the proportion of respondents who knew that even if they registered under 80 mg.% on a breath test they could still be charged with impaired driving was observed from the pre-test (35%) to the post-test (31%).

Little change was observed on measures of attitudes and opinions from the pre-test to the post-test. A decrease in the proportion of respondents who felt that stricter laws were required (66% in the pre-test to 33% in post-test) reflected the drivers' recognition of the new and stricter legislation. Only a slight increase in the proportion of drinkers who drink most often in the home (more than half) was observed. There was no change in the estimate of the number of drinks a driver could "safely" consume, self-perception of ability to drive after drinking, or the proportion who set personal rules for drinking and driving. The campaign made no attempt to influence attitudes towards drinking-driving but was designed solely to convey information about the provisions of the new laws. The results indicated that attitudes remained unchanged over the course of the campaign with the exception that fewer drivers felt that stricter laws were required subsequent to the campaign.

The evaluation of the effect of the programme on traffic safety measures was undertaken by Carr et al. (1974). Data were derived from several sources: police statistics of traffic accident injuries and fatalities and charges for drinking-driving offences, provincial coroner's data of BAC levels of traffic accident fatalities (data were limited to those provinces requiring blood tests of fatally injured drivers), and the Ottawa Police's reports of BAC levels of drivers tested on suspicion of being impaired. The data for the pre-legislation and post-legislation periods were compared and examined for changes in trends of traffic fatalities, distribution of fatal accidents by hour and day, BAC levels of fatally injured drivers, BAC levels of drivers suspected of impaired driving, and charges for drinking-driving offences using trend analysis of traffic accident data adjusted for cyclic effects, percentiles and chi square tests (Table 5). Significance levels for many analyses were not reported.

The effect of the countermeasure on traffic safety was not encouraging. Trends in fatal accidents showed evidence of a small, short-term reduction (6.3%) in 1970 from 1969 (4264 and 4549 fatal accidents, respectively) which was generally observed across the country. There were indications that road usage had not declined over this same period as evidenced by increased motor vehicle registration (2.9%) and gasoline sales (5.9%). But, a similar downward trend in fatal accidents observed in the United States (2.1%) without concurrent legislation suggested that some of the effects witnessed in Canada may have been due to factors other than the legislative countermeasure. The reduction in 1970 was followed by substantial increases in the number of fatal accidents in 1971 (4670) and 1972 (5233) which surpassed numbers reported in pre-legislation years.

Little impact was observed on alcohol involvement in fatal accidents. Nighttime and weekend data were examined, times when drinking and impaired driving are more prevalent. Trends in fatal accidents were analyzed for seven provinces in which an overall decrease in fatal accidents had been observed. Reductions from 1969 to 1970 were found in the proportion of fatal crashes occurring at night (29% to 27%, respectively) and on weekends (58% to 56%, respectively), but these were only transitory, returing to pre-intervention levels. Coroner's data available from three provinces indicated that the proportion of fatally injured drivers who were impaired at 100 mg.% or above in the first post-legislation year was only marginally below the average of pre-legislation years. The reduction was not statistically significant. The average BAC level of drivers tested by police in Ottawa was only slightly lower in the first post-legislation year (mean = 190 mg.%) from 1969 (mean = 210 mg.%). The distributions of BAC in both years was very similar with the exception of the 80 mg.% - 200 mg.% range; the proportion of drivers tested in 1970 falling within this range was larger than in 1969. This finding was most likely due to increased apprehension rates of drivers within the lower illegal BAC range rather than to reduced alcohol consumption among drivers, as the distribution of BAC levels in the higher range (ie. 200mg.% or above) did not change. Since the results of a breath test alone were sufficient to prove impairment, the police were more likely to charge a driver suspected of impaired driving who did not necessarily display gross physical symptoms of impairment. Police activity in Ottawa indicated that more than twice as many drivers were tested in 1970 compared with 1969, and that drinking-driving charges increased over the same period. Changes in BAC levels among accident-involved and nonaccident-involved drivers subsequent to the legislation were examined from the Ottawa data. A slight decrease in average BAC level was observed in 1970 from 1969 among both accident-involved (180 mg.% from 200 mg.%, respectively) and nonaccident-involved drivers (180 mg.% from 220 mg.%, respectively), but the differences were not tested for statistical significance.

In conclusion, there was some evidence of a small, short-term effect of the Breathalyzer Legislation on traffic safety. Reasons for the limited impact of this legislation on reducing the incidence of impaired driving have been offered by many, and involve basically problems associated with enforcement of the legislation and data source used for the evaluation. Detection of the impaired driver in order to remove him from the road was hindered by lack of training of officers in identifying early signs of impairment rather than relying on gross symptoms of intoxication, and the need for a roadside screening device to overcome problems associated with subjective assessments of impairment. The shortcomings of the data involved the absence of a standardized format among the provinces for reporting motor vehicle accidents and incomplete data for some provinces, and the inclusion of only fatalities "within six hours of an accident" in the coroner's data bank of BAC levels. In addition, the absence of a control group precluded any attempt to control for the influence of extraneous factors on traffic statistics. For example, serious accidents were observed to have declined relative to the trend in the pre-intervention period, but there was also a reduction observed in the United States, though not of the same magnitude, in the absence of the legislation.

6.1.2. Roadside Breath-Testing Legislation

The second demonstration of a systems approach utilizing a public information campaign combined with a legislative change occurred in Ontario following amendments to the Criminal Code to provide for roadside breath samples at the request of a police officer on the suspicion that the driver had been drinking. Previously, police officers were required to have reasonable grounds for suspicion of impairment in order to demand a breath test. The legislation represented an attempt to make enforcement of impaired driving offences more efficient. An increase in detection rates is hypothesized to lead to an increase in the subjective perception of risk of being apprehended for drinking and driving among the motoring public, which in turn influences the incidence of impaired driving. The federal legislation was amended in February 1976 and proclaimed at different times in different provinces. In Ontario, the changes were proclaimed in the Fall of 1976.

The public information/education campaign to introduce the provisions of the new legislation stressed the implications of the changes for the impaired driver. The objective of the campaign was to increase the subjective probability of arrest for impaired driving above the level that otherwise might be achieved by the introduction of the legislation alone. The six week campaign, consisting of television commercials and a newspaper advertisement emphasizing the adverse consequences of impaired driving, information on roadside breath-testing, and a description of the new legislation and penalties for impaired driving convictions, was implemented in selected centres in Ontario in February 1977, several months **subsequent** to the proclamation of the law in the Province.

The effect of the new legislation on impaired driving rates was not examined. The impact of the public information campaign was evaluated by Cousins (1980). The evaluation design included two control cities (Victoria, British Columbia where the Criminal Code amendments had not been proclaimed, nor had the public information campaign been implemented; and Sudbury, Ontario, which was located within the jurisdiction of the legislative changes but not exposed to the campaign, at least not until several months subsequent to the campaign presentation in Hamilton and Toronto) and two campaign cities (Hamilton and Toronto, Ontario which were exposed to the implementation of both the new legislation and the campaign). A three-wave telephone survey involved a pre-campaign survey conducted one week prior to the campaign onset, a post-campaign survey (ie. post-test [1]) conducted one week following the end of the campaign, and a second post-campaign survey (ie. post-test [2]) conducted three months later.

Independent samples of 150 respondents were obtained randomly with substitution for each survey and city. All were male, 18 years of age or older, drinkers, and had a valid driver's licence. Telephone interviews queried drinking habits, driving habits after drinking, demographics, exposure to various components of the campaign, awareness and knowledge of changes in the drinking-driving legislation, and four measures of subjective probability of arrest for impaired driving.

The campaign was successful in reaching a large proportion of the target audience in Hamilton and Toronto (Table 5). Within one week of the completion of the campaign, 86% of respondents were able to recall at least one element of the campaign; 80% recalled the T.V. commerical at post-test [1] compared with 29% at pre-test ($p < .01$), and 36% recalled the newspaper ad at post-test [1] compared with 16% at pre-test ($p < .01$). However, at post-test [2] conducted three months later, there was a significant reduction in campaign recall from post-test [1]; 67% recalled at least one element of the campaign, 61% recalled the T.V. commerical and 27% recalled the newspaper ad.

Comparison of the campaign and control samples for differences in knowledge levels from the pre-test to the first post-test using chi square test analyses indicated that immediately following the campaign general knowledge of legislative changes, and specific knowledge of (i) roadside testing as the new law and (ii) that drivers **suspected** of drinking would be requested to take a roadside test, increased significantly among campaign respondents but remained unchanged among control respondents (Table 5). Similar comparisons for changes from post-test [1] to post-test [2] indicated that knowledge gains were short-term and returned to approximately the pre-test levels within three months. General knowledge of legislative changes dropped significantly from post-test [1] to post-test [2] in the campaign cities to pre-test levels, but in the control city of Victoria a significant increase was observed over the two waves. The authors attribute this increase to publicized impending changes in the British Columbia provincial legislation pertaining to 24-hour licence suspension. Specific knowledge of "roadside testing" decreased significantly from post-test [1] to post-test [2] in Toronto to pre-test levels but no change was observed in Hamilton, whereas the reverse was found for specific knowledge of "suspicion of drinking".

Four measures of subjective probability of arrest for impaired driving were analyzed for changes over the three waves using analysis of variance (Table 5). Three of these measures did not change as a result of the media campaign and new legislation: probability of the average person being arrested for impaired driving, probability of the respondent being arrested for impaired driving, and probability of being stopped by police if impaired. The last measure, the probability of being detected and charged if stopped by the police while impaired, increased significantly from pre-test to post-test [1] for the campaign sample but remained unchanged for the control sample. Except for a slight decline in Toronto, there was no change at post-test [2] from post-test [1]. Thus the positive impact on one measure of subjective probability of arrest for impaired driving remained basically unchanged over the three-month interval. The author found this apparent stability suprising in light of the return to pre-campaign levels of knowledge measures within three months, and suggested that the campaign exposure may have been responsible for the initial positive shift in risk perception witnessed at post-test [1] but that other factors such as enforcement practices or associated publicity may have maintained a long-term effect.

The finding that the subjective probability of arrest for impaired driving increased in the campaign cities but not in the control cities despite the fact that one of the control cities was under the jurisdiction of the new legislation indicated that changes in the law solely may not be sufficient to increase perception of risk. On the other hand, mass education efforts appeared to have only a short-term effect. Overall, the countermeasures were effective in communicating information to the public as evidenced by the increased level of awareness of the legislative changes and recall of specific changes. The short-term duration of these effects, however, suggest that the campaign should be repeated intermittently to maintain the high levels of awareness. Television was indicated as the most effective medium for communicating information.

6.2. Spot-Check Enforcement and a Public Information/ Education Campaign

6.2.1 Reduce Impaired Driving in Etobicoke Programme

The combination of random spot-check enforcement and a **single** public information/education campaign was demonstrated by the R.I.D.E. programme. The R.I.D.E. programme (Reduce Impaired Driving in Etobicoke) was first introduced in Etobicoke, a borough of Metropolitan Toronto and one of five Toronto police districts, in 1977 as a demonstration project to deter potential drinking-driving behaviour and to increase apprehension of those already on the road. The programme was designed after other countermeasure programmes, incorporating demonstrated effective components of public information and spot-check enforcement from those programmes. The target population was drivers in the Borough of Etobicoke. The programme and evaluation have been summarized by Vingilis et al. (1979, 1980) and Vingilis and Salutin (1980).

The enforcement component was designed to increase both the detection and the perception of risk of apprehension of the drinking driver through roadside spot-checks at more than 100 locations throughout Etobicoke, representing high visibility, high traffic flow, high frequency of traffic accidents and offence sites. Spot-checks were conducted daily, 10 a.m. to 3 a.m., at randomly selected sites by specially equipped police cars to identify the spot-check activity as part of the R.I.D.E. programme. Drivers were screened using a roadside screening device (A.L.E.R.T.). If the BAC reading was greater than 80 mg.%, the driver was transported to a police station for a breathalyzer test. During the spot-check, police provided an explanation of the enforcement programme and issued pamphlets on the programme.

The purpose of the public information/education component was to inform the public about the increased enforcement activity and the drinking-driving laws and penalties through a mailing campaign of pamphlets descriptive of the programme, distributed to every household in the borough during the first two weeks of the programme. Media coverage of the campaign was extensive, but unplanned for.

The evaluation design involved measuring changes in knowledge, awareness and risk perception by means of a three-wave (ie. one month prior to, one month post- and ten months post-intervention) random telephone survey in which 150 Etobicoke residents and a comparison group of 150 Metro residents per phase were interviewed. The survey included five knowledge items (ie. maximum BAC allowed under the Criminal Code, proportion of fatal (driver) accidents involving alcohol, standard measuring device for determining BAC, the three drinking-driving offences under Canadian law, and length of time required by an average-sized person to metabolize the alcohol contained in one standard drink), two awareness items (ie. aware of the R.I.D.E. programme, and meaning of the acronym R.I.D.E.), and two risk perception items (ie. the **average person's** risk of getting caught were he to drink and drive, and **own** risk of getting caught were one to drink and drive). Drinking-driving behaviour was assessed from several sources: police data for impaired driving charges in five police districts from January 1976 to October 1978; a police attitude questionnaire issued to officers operating in the campaign area and the adjacent control district prior to and during the programme which queried changes in attitudes and/or policing concurrent with the programme, and perceptions of the number of suspected impaired drivers and impaired driving arrests; police accident data for the years 1972 to 1978 reporting alcohol-related accidents and injuries for all five police districts; and impaired driver information from the province-wide Independent Roadside Survey carried out in 1974 and repeated in 1979.

The results of the first-year evaluation using analysis of variance and Tukey HSD comparison of means procedure indicated significant increases among the public in awareness of the

R.I.D.E. programme, one measure of risk perception for being apprehended while drinking and driving, and knowledge about drinking and driving (Table 5). Significantly more Etobicoke residents than Metro residents were aware of the R.I.D.E. programme at both one month and ten months subsequent to the implementation of the campaign (p <.001). Newspapers, magazines and the electronic media were reported as the primary source of publicity about the programme, a finding which raised some doubts about the efficacy of the household mailing campaign as a distribution method of the information pamphlets. The programme had no impact on perception of **own** risk for being apprehended for drinking and driving. Perception of risk of apprehension for the **average person** was found to be significantly higher at both post-test [1] and post-test [2] than at the pre-test among the Etobicoke sample, while no significant differences were observed for the Metro sample. When compared with Metro respondents, Etobicoke respondents perceived significantly lower risk of apprehension for the **average person** before the R.I.D.E. intervention (pre-test mean score = 3.35 compared with 3.07 for Metro), significantly greater risk immediately following implementation of enforcement activity (post-test [1] mean score = 2.67 compared with 2.90 for Metro), and no significant difference ten months after intervention (post-test [2] mean score = 3.02 compared with 2.98 for Metro). The authors caution that the Etobicoke data may reflect regression to the mean, and avoid making definitive interpretations. The total knowledge scores for the Etobicoke sample at both post-test [1] and post-test [2] were significanty higher than at the pre-test, however the short-term effect was stronger than that observed ten months after intervention; some of the information about drinking and driving acquired at post-test [1] was lost by post-test [2]. Knowledge scores of the Metro sample did not differ significantly over the surveys. When compared with Metro, the Etobicoke sample did not differ significantly on average total knowledge score before the R.I.D.E. programme (pre-test mean score = 1.58 compared with 1.49 for Metro), but had significanty higher scores one month post-intervention (post-test [1] mean score = 2.37 compared with 1.45 for Metro) and ten months post-intervention (post-test [2] mean score = 1.93 compared with 1.53 for Metro).

From the available traffic data there were indications that there may have been a reduction in the number of impaired drivers on the road in Etobicoke (Table 5). The number of impaired driving charges laid were compared for Etobicoke and the remaining four Metro police districts by time series analysis. A significant ($p < .05$) increase in the number of impaired driving charges was observed in Etobicoke over the intervention period, when the R.I.D.E. spot-check statistics were included in the analysis. However, when the charges laid by the added manpower of the R.I.D.E. spot-checks were removed from the Etobicoke data, a significant ($p < .05$) reduction in impaired driving charges laid by routine patrolling was observed in Etobicoke which was not apparent in the other Metro districts. The results of the police questionnaire administered to Etobicoke officers and those in an adjacent district both prior to the onset of R.I.D.E. and during the programme indicated a different perception of enforcement activity. Traffic officers in Etobicoke compared with those outside the R.I.D.E. district perceived themselves as stopping significantly ($p < .05$) more vehicles for suspected impaired driving since the implementation of R.I.D.E., but no change in the number of impaired driving arrests.

There was no conclusive evidence in support of a reduction in alcohol-related accidents and injuries, or change in the BAC levels of accident and nonaccident-involved arrested drivers concommitant with the R.I.D.E. intervention (Table 5). Police-reported alcohol-related accident and injury data for Etobicoke and the other four Metro police districts were compared using time series analyses and t-tests. A generally downward or unchanging trend for all districts was found. The overlap of the R.I.D.E. programme on neighbouring districts as a result of the extensive media coverage, and the general leveling off of alcohol consumption in Ontario were offered as possible explanations for this trend. The BAC levels of suspected impaired drivers did not change significantly during the intervention programme, while those of drivers involved in accidents and administered a breathalyzer increased significantly in only one Metro district and remained unchanged in the others including Etobicoke. In addition, data from two independent roadside surveys conducted throughout the province indicated that the proportion of Etobicoke drivers who were impaired eighteen months after the

R.I.D.E. implementation had not changed from that observed more than three years earlier.

The traffic data were difficult to interpret for many reasons. Outcome measures were contaminated by the general inaccuracy of the data source, inadequacy of the evaluation design and the influence of external events. Separate nighttime or weekend accident statistics were limited by small numbers and prevented the use of more rigorous criterion measures. Fatality figures on a monthly basis were too small to be useful, and the proportion of high risk drivers deterred from drinking and driving might not have been large enough to cause a substantial reduction in alcohol-related accidents. Also, the data showed inconsistent variation. A province-wide administrative change doubling the value of damage which made an accident reportable occurred almost simultaneously with the expected first full impact of the programme, an event which confounded analysis of the effect of the intervention strategy on accident statistics. Finally, the BAC measurements of all drivers involved in accidents were not available as blood tests to determine the BAC are not done on all fatally injured drivers nor routinely on surviving drivers. Alcohol-relatedness of accidents was determined by the investigating officer and subject to bias associated with subjective assessment.

Overall, the programme was viewed favourably as an attempt to deter a proportion of the drivers from drinking and driving based on the evidence of reduced impaired driving charges, increased risk perception of apprehension for impaired driving, and increased knowledge levels on drinking-driving issues among Etobicoke residents. However, the shortcomings of the data and evaluation design prevented any firm conclusions about the impact on traffic safety.

6.2.2 Reduce Impaired Driving Everywhere Programme

The R.I.D.E. programme was extended to all of Metro Toronto in 1979 and the acronym changed to "Reduce Impaired Driving Everywhere". The programme components, implementation procedures and evaluation design were essentially the same as those of the Etobicoke programme.

The Metro Toronto phase was evaluated after one year (Vingilis et al., 1981). Measures of public awareness, knowledge and risk perception were compared for Metro Toronto (excluding Etobicoke) and the control city Hamilton from data obtained in a three-wave (one pre-test, two post-tests) telephone survey of 100 Metro Toronto and 100 Hamilton randomly selected residents per wave (Table 5). Respondents were 18 years of age or older and possessed a valid driver's licence. The knowledge questionnaire used in the Metro Toronto R.I.D.E. phase differed from that of the Etobicoke phase. The programme was successful in reaching a large proportion of the target population; 83% of the Metro Toronto residents had heard of R.I.D.E. Total knowledge scores on drinking-driving issues improved significantly over time in both Toronto and Hamilton, but scores were consistently higher in Toronto than in Hamilton at pre-test (mean scores = 2.52 and 2.03, respectively), post-test [1] (mean scores = 2.68 and 2.34, respectively) and post-test [2] (mean scores = 2.88 and 2.64, respectively). No significant **positive** impact on risk perception was found. Subjective perception of personal risk decreased with time. **Personal** risk of apprehension for drinking and driving was lower at both post-test times than at pre-test for Metro Toronto respondents, whereas Hamilton respondents perceived the greatest risk at post-test [2]. The Metro Toronto sample perceived a significantly higher risk of apprehension than the Hamilton sample before the onset of R.I.D.E. (pre-test mean score = 2.54 compared with 2.96 for Hamilton) and a month after the onset (post-test [1] mean score = 2.74 compared with 2.96 for Hamilton), but the impact was not sustained over the following eighteen months as evidenced by a significantly lower risk perception at post-test [2] among Metro Toronto respondents (mean score = 2.97) compared with the control group (mean score = 2.73). No significant change was found for the perception of the **average person's** risk of apprehension.

Changes in impaired driving charges and accidents were assessed from police data for Metro Toronto (excluding Etobicoke) and the control city Ottawa using time series analyses (Table 5). Inconsistent trends in the number of impaired driving charges were found among the Metro Toronto police districts; there were no differences in total charges (ie. including R.I.D.E. patrol data) and number of charges excluding R.I.D.E. patrols for the pre-intervention and intervention periods for districts 1 and 3, whereas district 4 showed a significant increase (p <.01) and district 5 a significant decrease (p <.01) for the intervention period. No significant differences in total charges for alcohol-related offences for the pre- and intervention periods were observed in the Ottawa area. Accident data were examined for changes in nighttime (6 p.m. to 6.a.m.) vs. daytime (6 a.m. to 6 p.m.) and weekend (Thursday through Sunday) vs. weekday (Monday through Wednesday) fatalities, injuries, total accidents and alcohol-related accidents for Metro Toronto and Ottawa. No changes were found indicative of a **positive** countermeasure impact. The results of a questionnaire on police attitudes toward drinking-driving enforcement administered to all traffic divisions in Metro Toronto and the control Ottawa indicated that perceived policing procedures did not change significantly in either Metro Toronto or Ottawa during the intervention period.

Overall the R.I.D.E. programme had little impact on traffic safety in Metro Toronto. The majority of the motoring public were aware of the programme but failed to perceive an accompanying increased risk of apprehension for impaired driving. Knowledge levels of drinking-driving issues increased significantly in Metro Toronto during the intervention period, but a similar increase was observed in the control city Hamilton in the absence of the R.I.D.E. programme. Trends in impaired driving charges and accidents provided no conclusive evidence in support of a reduction of drinking and driving during the intervention period.

Interpretation of the results of the Metro Toronto R.I.D.E. programme were limited by several methodological problems. The pre-intervention period data for Metro Toronto was most likely contaminated by overlap from the prior R.I.D.E. Etobicoke campaign. Similarly, the Niagara Region, bordering the telephone survey area for the control city Hamilton, initiated a similar R.I.D.E. programme mid-way through the Toronto campaign which more than likely contaminated the Hamilton data. Also, the post-test data may have been confounded by the effect of external events such as an extensive Christmas drinking-driving public information campaign and a decision by the Ontario Supreme Court declaring the spot-check activity illegal which resulted in the termination of the R.I.D.E. programme. Manpower shortages within the Toronto police force severely curtailed spot-check frequencies resulting in inconsistent scheduling during the intervention period.

6.3. Spot-Check Enforcement and Intermittent Public Information/Education Campaign

The following three programmes illustrate the use of spot-check enforcement accompanied by **intermittent** public information/education campaigns.

6.3.1. Niagara Drinking and Driving Project

The Niagara Drinking and Driving Project (Clayton, unpublished) was a public information and education campaign designed to complement and reinforce a police spot-check programme aimed at impaired drivers in the Niagara Region of Ontario. The purpose of the project was to create an effective general deterrence programme against impaired driving by the use of an enforcement campaign to detect impaired drivers and increase the subjective perception of risk of apprehension, and intermittent public information/education campaigns to increase and maintain the public's awareness of the enforcement component and their knowledge of the problem of drinking-driving, related laws and penalties, and the effect of alcohol on driving performance. The target population was all drivers in the Niagara Region.

The enforcement campaign was implemented in December 1979 with special campaigns conducted during the summer and over Christmas/New Years. The enforcement programme was modelled after the R.I.D.E. programme in Toronto. Spot-checks were randomly selected, rotated, and manned by teams of trained officers. Prior to the campaign, the press and media were issued press releases introducing the programme and the concepts of the drinking-driving campaign. In addition, extensive media coverage was given to the programme during the first few months of the enforcement as a result of public controversy created by opposition to the programme by bar and tavern owners. The campaign was temporarily halted for six months during the evaluation period following an Ontario Supreme Court decision declaring the spot-check activity illegal.

The public awareness and education campaigns were conducted over a two-year period beginning after the onset of the enforcement campaign. The four intermittent campaigns utilized mall displays, information packages distributed to community agencies, schools, and companies, speaking engagements, cable television series, paid advertising, press releases, radio public service announcements, information pamphlets, bumper stickers, flyers and lesson plans for school curriculum. Content of the campaigns included awareness of the enforcement component, problems associated with drinking-driving, effects of alcohol on driving performance, and drinking-driving laws and penalties.

The evaluation design involved three surveys. The **first** was a pre-intervention telephone survey for baseline data on awareness and general knowledge of drinking-driving topics, conducted approximately one month prior to the enforcement campaign with 308 drivers in the region who were above the legal drinking age (response rate not reported). The mean score for knowledge items was 1.6 on a scale with a possible maximum score of 8; 79% of respondents had a score of 2 or lower.

The R.I.D.E. programme had been in operation for several months before a decision was made to systematically assess the population's knowledge. The information to be gathered was needed to determine the content of a public education campaign scheduled for the fall of 1980. The second survey therefore was conducted as a planning survey shortly after the first media campaign and approximately seven months subsequent to the implementation of the enforcement campaign, to establish knowledge levels of the extent of the drinking-driving problem in the Niagara Region, blood alcohol concentration, drinking-driving myths, and laws and penalties (Cumming, 1981). Telephone interviews were conducted with a random sample of 274 drivers aged 18 years and older, representing a response rate of 67%. Males were under-represented in the sample (36%) compared with regional estimates (49%). Ages ranged between 18-35 years (46%) and 36-55 years (32%). The questionnaire consisted of twenty-seven items describing age and sex; attitudes towards drinking and driving as a problem and police enforcement of drinking-driving laws; and knowledge of the effects of alcohol on the body, drinking-driving laws and penalties, drinking-driving myths, and alcohol equivalencies. The mean knowledge score was 8.3 out of a possible maximum score of 16; 50% of the sample scored 8 or lower, indicating a general lack of knowledge about drinking-driving issues, especially drinking-driving laws and penalties. The mean opinion score was 4.2 out of a possible maximum score of 6; 76% of the sample scored 4 or higher, indicating generally high agreement with the seriousness of drinking and driving.

Following the results of the second survey, a major portion of the campaign concentrated on impaired driving laws and penalties. A flyer describing this information was distributed to every home in the region. A second flyer dealt with the effects of alcohol on driving ability. A series of radio spot announcements were developed and broadcasted during the rush hour periods and two ads were published in the regional daily and weekly newspapers, emphasizing the laws, penalties and alcohol equivalencies as related to impaired driving.

The **third** survey was a post-intervention assessment of knowledge and opinion levels and awareness of the enforcement campaign approximately fourteen months after the onset of the enforcement campaign and approximately seven months after the first media campaign. By this time the public had been exposed to the initial enforcement campaign and media coverage, the summer education and enforcement campaigns, and the Christmas education and partial enforcement campaign. However, mass distribution of educational materials or paid advertising had not yet occurred. The survey method involved telephone interviews with 144 drivers 18 years of age or older systematically selected from the telephone directory for each municipality and rural area in the Niagara Region.

The results of the outcome evaluation, using chi square tests for significance, indicated that the programme of intermittent increased enforcement activity and media campaigns over a fourteen-month interval had some impact on awareness levels and knowledge levels (Table 5). Almost all of the respondents were aware of the R.I.D.E. campaigns by the third survey (96%), a significant increase from pre-test (17%). However, only a small proportion could correctly identify the meaning of the acronym (15%), but again this represented a significant increase from the pre-intervention survey (2%). Few knowledge items measured at pre-test were also included in the post-test surveys, permitting only a limited comparison of change over the intervention period, using analysis of variance. The proportion of respondents with the correct knowledge of the legal BAC limit at the first post-test (7 months) and the second post-test (14 months) was significantly higher ($p <.001$) than at the pre-test, although there was some loss of knowledge between the last two surveys. The remaining knowledge items were comparable only for the post-tests, and no significant change in mean knowledge levels was found from post-test [1] to post-test [2] when age and sex of respondent were controlled for. This finding, however, could actually represent a positive campaign effect. Although comparable pre-test data were not available for evaluation, given that knowledge levels were possibly raised from the pre-intervention survey to the first post-test seven months later as a result of the enforcement and campaign activity, then the absence of change from the first post-test to the second post-test during another seven month period of intermittent campaign presentation may represent the success of the programme design to maintain a positive impact over an extended period of time. Although this speculative interpretation was supported by evidence for one knowledge item (ie. legal BAC limit), without adequate pre-test/post-test comparisons no conclusions can be drawn. Opinion levels were measured only at post-intervention intervals. Controlling for age and sex of respondent, no significant difference in mean opinion scores was observed from post-test [1] to post-test [2].

The main problem with the evaluation was the limited comparable data. First, the bulk of baseline knowledge and opinion levels was measured subsequent to the onset of the intervention programme, preventing an adequate assessment of a programme effect uncontaminated by the influence of enforcement and media campaign activity and the associated publicity. Secondly, the questionnaires were not designed to include similar items for all three surveys, thus the comparisons were restricted. In addition, the interviewing procedures were not consistent over the three waves.

Despite the methodological problems with the evaluation design there was some indication that the programme of intermittent enforcement and public information/education campaigns was effective in raising and maintaining the awareness of the enforcement activity among almost all drivers in the targeted area, and in communicating information about drinking and driving to a large proportion of the driving public over an extended period. Unfortunately any impact on drinking-driving behaviour was not reported.

6.3.2. Alberta CHECK-STOP Programme

Increased enforcement activity accompanied by an intermittent mass public information/education campaign was implemented as the programme CHECK-STOP throughout Alberta, beginning in the fall of 1973. Programme description and evaluation were reported by the Alberta Solicitor General (1974) and Morton et al. (1975). CHECK-STOP was designed as a primary and secondary intervention strategy with two components. The first component was enforcement activity to increase the subjective and objective probability of risk of apprehension or arrest and to remove the impaired driver from the road. The second consisted of two public information/education campaigns to inform the Alberta public of the dangers and consequences of drinking and driving, and to increase awareness of the roadside spot-check programme. The intent of the programme was to change public attitudes towards drinking and driving. The objective was to deter drivers from drinking and driving and to detect those drinking drivers already on the roads.

The first public information/education campaign was implemented several weeks prior to the enforcement campaign, and continued for several months. Advertising campaigns were conducted on television, radio and in the press, including an immediate intensive information phase to acquaint the driving public with the purpose of the programme. A CHECK-STOP logo was developed. A second campaign was implemented in 1975 and continued for approximately six months. Radio, television, newspapers, outdoor advertising and point of purchase advertising were employed to attain the following objectives: inform the public of alcohol knowledge, persuade potential drinking drivers to refrain from such behaviour, and involve the public in preventing impaired persons from driving. The message conveyed was "don't drink and drive." Supplementary publicity was provided by favourable articles and editorials in daily newspapers.

The enforcement component was intended to supplement normal police activity. Roadside spot-checks were established throughout the province at random locations separate from those of routine spot-checks, and identified as part of the CHECK-STOP programme by the use of signs and information pamphlets. Sites were frequently changed. Duration at a site was approximately one-half hour. Spot-checks were conducted in the late evening and early morning hours, most often on Thursdays, Fridays and Saturdays, generally throughout the year but emphasis was on holidays. Participation by any police department was voluntary and usually depended upon the availability of manpower and equipment. The R.C.M.P. was responsible for most areas other than major urban centres. Their interest and participation was reportedly constant. Outcome of a spot-check involved the distribution of pamphlets describing the programme to drivers when no drinking had been suspected, a 24-hour licence suspension when there were indications that the driver had been drinking but was not impaired, or a charge for impaired driving if the driver was suspected of being impaired.

Measures of awareness, attitude and knowledge changes were evaluated separately from that of traffic safety (Table 5). Changes in awareness and public attitudes towards drinking and driving as a result of the public education campaigns were assessed by telephone surveys of 300 residents 18 years of age and older prior to (pre-test), midway through (post-test [1]), and approximately two months subsequent to completion of the first campaign (post-test [2]), and a telephone survey of 500 residents 18 years of age and older approximately two months subsequent to the introduction of the second campaign (post-test [3]). The results of the evaluation were not tested for statistical significance but indicated that during the peak of the campaign, a majority of respondents (79%) were aware that the police were doing something special about drinking and driving, but under (44%) could identify correctly the CHECK-STOP programme. By the completion of the campaign fewer respondents were aware of special police activities (71%) but more correctly identified the programme (55%). Awareness declined over the long-term as evidenced by only 58% of respondents cognizant of the special enforcement efforts and the correct identification of CHECK-STOP by only 41% twenty-one months after the onset of the programme. When asked directly whether or not they had heard of CHECK-STOP, almost all respondents (94%) answered affirmatively and 85% of these were able to describe the programme as spot-checks for alcohol. The authors attribute the decline in awareness to a decline in the special nature of the programme, that is it was no longer novel. The level of penetration of the campaign message was reportedly low (ie. only 10%-30% of respondents could recall specific messages).

Attitude levels were found to increase in a positive direction from pre-test to post-tests and remained steady for at least six months from the onset of the media campaigns. Neither descriptive statistics nor testing for statistical significance were reported. Generally, the public were aware of the seriousness of the drinking-driving problem, were satisfied with public education and police efforts to combat the problem, but also expressed a need for more to be done in the area. The public expressed a positive reaction to and an acceptance of the CHECK-STOP programme and thought it was effective in reducing deaths from drinking and driving, and that it effected some change in drinking and driving habits. Knowledge levels, on the otherhand, remained unchanged from pre-test levels. The public retained little of the statistical information presented in the advertising campaign.

The evaluation also produced useful information about the dynamics of media campaigns. For example, the authors report that the public's perception of feeling informed was more important than the actual level of being informed (ie. degree to which the public retained the information). They found that the more advertising the public was exposed to, the more the public was satisfied with the degree of public education about drinking and driving, whereas the less advertising, the less the feeling of satisfaction. Changes in attitudes were derived from police reports which indicated that motorists exercised greater caution during the winter holiday season, making use of other means of transportation as an alternative to drinking and driving.

Evaluation of the public information/education component was limited by the following methodological problems: the absence of a control group, poor design of survey questions biasing responses in favour of a positive result, and the possible confounding level of enforcement activity with risk perception. In the later case, the R.C.M.P. were reported to have concentrated their enforcement activity in rural areas but the data were not analyzed separately for urban and rural areas. The authors suggest that the programme may have been more successful in rural areas than suggested by the overall data.

Evaluation of the enforcement component involved comparison of R.C.M.P. traffic data for the first four months of CHECK-STOP operation with a comparable four-month period the year prior (Table 5). Differences on outcome measures were not tested for statistical significance. After four months of operation there was a 10% decrease in fatal accidents from the same period the previous year (67 from 73, respectively), a 16% decrease in alcohol involvement in fatal acccidents (38% from 55%, respectively), and an increase in arrests for alcohol-related driving offences (2071 from 1623, respectively). The implementation and evaluation of the enforcement campaign was hindered by the following problems: attempts to randomize the site locations was limited by the number of **safe** sites; lack of special training in spot-check activity and detection of the impaired driver among police officers; the distribution of CHECK-STOP activity was uneven throughout the Province and underrepresented in high density areas; data were not collected centrally; and the availability of manpower was inconsistent.

Overall the programme was considered successful because it was supported by the public, business community and police, the public was largely aware of the programme, and alcohol-involvement in accidents declined.

6.3.3. British Columbia COUNTERATTACK Programme

An intermittent public information/education campaign combined with an enforcement programme utilizing mobile breathalyzer units was implemented throughout British Columbia in 1977 as the COUNTERATTACK programme (Rockerbie, 1980). The objective of the programme was to influence drinking behaviour to effect a reduction in the incidence of alcohol-related traffic accidents, through a system-oriented approach to intervention.

The public education component was a prevention strategy to heighten awareness of the drinking-driving problem and lower public tolerance to this type of behaviour. The enforcement component was designed to increase actual and perceived risk of apprehension.

The public information/education component supported the introduction of the enforcement component with a province-wide publicity campaign on television for thirteen weeks. The campaign served to inform the public of the introduction of the special police mobile units and to enhance the awareness of the public to the problem of impaired driving, social responsibility and the COUNTERATTACK programme. A second campaign was implemented in late 1978 for a ten-week period. Extensive television advertising was used to publicize roadblock enforcement strategy and to create special awareness of the drinking-driving problem during the Christmas-New Year holiday season. A third campaign commenced in the spring of 1979, almost two years subsequent to the initial campaign, and was restricted to radio.

The media campaigns were evaluated for their effectiveness in reaching the target audience (Table 5). The design did not include a control group nor a pre-test of outcome measures. Data were derived from two surveys, the first conducted in 1978 by Transport Canada, and the second fifteen to sixteen months later at a public display during the Pacific

National Exhibition in Vancouver. Outcome measures consisted of recall of television and radio ads. Fictitious ads were included in the survey for a baseline measure of validity of recall. At the first post-test, recall of television ads was high (85.9%), recall of radio ads was low (12.2%) and recall of bogus ads was low (6.8%-11.7%). Differences were not tested for statistical significance. Awareness of the campaign messages was still high approximately two years after the onset of the campaigns (73.1% recall of television ads and 68% recall of radio ads). The long-term effect of increased awareness may be attributed to the influence of the two advertising campaigns associated with the COUNTERATTACK programme and a saturated advertising campaign on television advocating alcohol use in moderation sponsored by the Ministry of Consumer Affairs which had been in effect over the course of the post-testing, and local campaigns not reported in the literature.

The enforcement component consisted of the use of "BATmobiles", which were police vans equipped with breathalyzer units, at roadside spot-check locations. Approximately fourteen vehicles were in operation initially. Time series analysis on alcohol-related fatal crash data indicated a significant reduction (19.5%) over the first year of operation (1977) compared with the previous year (1976). Over the same period there was a 16.1% increase in nonalcohol-related fatal accidents. Comparable figures for 1978 and 1979 showed a 3.6% increase and 2.7% decrease, respectively, for alcohol-related fatal crashes and a 24% decrease and a 7.6% increase, respectively, for nonalcohol-related fatal crashes (Table 5). These trends were not tested for statistical significance. Although there was a downward trend in the number of charges for impaired driving in the intervention period (22,426 in 1977 and 21,219 in 1978) from the pre-intervention period (23,036 in 1976), a concomitant increase in 24-hour licence suspensions issued was observed (17,712 in 1976, compared with 19,937 in 1977 and 19,678 in 1978).

In summary, the combination of an extensive and intermittent public information/education campaign to increase awareness of an enforcement component which utilized mobile breathayzer units for roadside breath-testing was considered effective based on the three-year evaluation. The findings indicated a high level of public awareness about the programme, a reduction in alcohol-related fatal crashes, and an increase in the apprehension rate. The intermittent scheduling and lengthiness (eg. thirteen weeks and ten weeks duration) of the public education campaigns may have served to increase and maintain the awareness level. However, the evaluation was limited by the absence of a pre-test of awareness level.

6.4. **BAC Feedback and Spot-Check Enforcement Campaign**

Nau and Van Houten (1984) suggest that a proportion of individuals who drive while impaired do so because they are unaware that their BACs exceed the legal limit, and that to provide drinkers with feedback about their BACs before they attempt to drive could be an effective method of reducing the incidence of impaired driving. They argue further that self-regulation by the potential impaired driver throughout the course of an evening of drinking would prevent impairment in the first place, and thus avoid problems associated with a driver receiving BAC feedback at the end of the evening when he/she is already impaired and ready to drive home (eg. avoid the common problem of having to arrange alternative means of transport). Self-regulation could be achieved by the use of material informing the driver about the legal limit, and the maximum number of drinks and the maximum drinking rate allowable if impairment is to be avoided. Such information would be made available before the driver commenced to drink.

Two demonstrations of the use of BAC feedback to reduce impaired driving in Canada have been reported. The first was conducted with tavern patrons in British Columbia (Calvert-Boyanowsky and Boyanowsky, no date) and discussed under the technological approach section of this paper. The most recent demonstration was introduced to several taverns in Nova Scotia and combined with a police enforcement campaign. A summary of this trial follows.

6.4.1. Dartmouth/Halifax Tavern Demonstration

A programme aimed at reducing impaired driving through self-regulation of drinking behaviour, BAC feedback and police spot-check enforcement activity was implemented in selected locations in Halifax and Dartmouth, Nova Scotia (Nau and Van Houten, 1984).

The **self-regulation** component consisted of the distribution of guides on how to avoid impairment to patrons of selected drinking establishments in the study area upon their arrival. The guides provided a pre-calculated hourly alcohol consumption rate to maintain a drinker at a BAC below 80 mg.%. The rate was adjusted for type of beverage (eg. draft beer, mixed drinks, bottle beer) and weight of drinker (ie. within range of weight categories). Patrons were informed that the guides would help them to pace their drinking in order to avoid becoming impaired, and were distributed to passengers and pedestrians as well as to drivers.

Subjects for data collection were recruited upon leaving the tavern. All subjects agreeing to participate were administered a short questionnire to obtain information on the sex of the patron, date, time, location of the interview, amount and type of beverage consumed during the evening, length of time drinking, estimated weight of patron, and means of transportation planned to be used upon leaving the tavern to return home (ie. taxi, passenger in a private vehicle, bus, walking, driving a private vehicle). The questionnaire also included marketing information of interest to the owner of each tavern in turn for co-operation in permitting the study. Upon completion of the questionnaire, the subject was issued a lottery ticket. Random breath tests were obtained for approximately one-third of the sample using an A.L.E.R.T. device, and a second lottery ticket was issued to those tested. The breath test results were used to verify the self-report consumption data obtained from the questionnaire.

The **BAC feedback** component of the programme consisted of providing a BAC estimate to subjects during the course of the interview. The BAC estimate was calculated from information supplied in the questionnaire describing volume of consumption, length of time consuming and the subject's weight and age. They were also informed as to whether or not their BACs' were over the legal limit. In addition, patrons were provided with feedback about the percentage of drinkers who had driven home while impaired during the preceding week-end by means of a sign displayed prominently at the interviewing table.

The **enforcement** component involved police spot-checks set up at predetermined locations in close proximity to and on major routes travelled by patrons leaving drinking establishments. Police randomly stopped vehicles passing the check-points, and administered breath tests using A.L.E.R.T. devices when a driver was suspected of having been drinking.

According to the outcome of the A.L.E.R.T., drivers were either released to continue driving, encouraged to find alternative transportation, or taken to the police station for breathalyzer testing. A flyer warning of the hazards of and penalties for impaired driving was distributed to all drivers stopped.

The effectiveness of the programme was evaluated by first testing the self-regulation/feedback procedure in the absence of spot-check enforcement activity, and then testing the two procedures in combination.

The first test was conducted with patrons of two drinking establishments in the Halifax area and two in the Dartmouth area. All four had a capacity of 200-270 people and featured live music. One catered to a working-class clientele, one to a mainly middle-class clientele, and the remaining two to a mixed working- and middle-class clientele of which one was frequented mainly by a younger crowd (ie. a greater proportion were under 30 years of age). Data were collected on Thursday, Friday and Saturday nights between the hours of 11:00 p.m. and 2:00 a.m. by testing teams comprised of two or three female or male university students, located in close proximity to the exits of each tavern. The experimental design included two conditions: (1) the **control** condition which served to measure baseline data, and involved only the interview and the random breath-testing procedure; and (2) the **experimental** condition which involved the distribution of the self-regulation guides to arriving patrons between the hours of 7:00 p.m. and 2:00 a.m., the interview, random breath-testing procedure, and BAC feedback during the course of the interview. Three of the taverns in the study were exposed first to a period of baseline data measurement before inclusion in the experimental condition. The fourth tavern provided baseline data for the entire study period.

Measures of BAC and the percentage of drivers impaired were compared for the control and experimental conditions for each tavern. The results indicated that the mean estimated BAC of **drivers** leaving the taverns during the intervention period did not differ from that observed during the pre-intervention period. A slight reduction was observed in the Dartmouth samples (mean estimated BAC = 97 mg.% from 110 mg.%) while a slight increase was observed in the Halifax sample (mean estimated BAC = 131 mg.% from 115 mg.%), but the authors suggest that these changes may have been the result of factors other than the intervention procedures. Also, the introduction of the intervention condition had no effect on the BACs of **passengers** (mean estimated BAC = 119 mg.% for both the control and experimental conditions). The percentage of impaired drivers did not change substantially with the introduction of the intervention methods. The percentage of impaired drivers was calculated by dividing the number of drivers whose estimated BACs were over 80 mg.% by the total number of drivers interviewed. A decline in the percentage during the intervention period from baseline data was observed in the Dartmouth samples (44% from 51%) while an increase was observed in the Halifax samples (63% from 54%), but, again, the authors attribute these changes to weekly variability and other uncontrolled for factors.

Although the data was not tested for statistically significant differences, the results offer little evidence to suggest that a programme of self-regulation and BAC feedback is sufficient to decrease the incidence of impaired driving. The poor outcome was not likely due to subject bias. For example, refusal rates were tallied and ranged from 14%-25%. Reliability of self-report data on consumption patterns used to calculate BAC estimates did not show any change following the introduction of the intervention procedure. The reliability of subjects' self-report on intention to drive upon leaving the tavern was determined by parking lot surveillance of actual behaviour for approximately 21% of the sample. Agreement between intended and actual driving behaviour was high ranging from 94%-100%.

The authors considered this programme to represent an intensive comprehensive feedback procedure, and expressed doubts that anything less would produce a positive effect. They imply that self-regulation and feedback components are ineffective mainly because of the problem of securing an alternative means of transport. For example, the suggestion of allowing a friend to drive as an option may not be as feasible as hypothesized. Based on the results of this study, passengers were found to have similar BAC levels as drivers. Secondly, the cost of alternative transportation (eg. taxi) was prohibitive. The authors also suspected that the component features of the programme may not have been functioning in the postulated manner, and thus contributed to the lack of observed impact. Specifically, there was evidence to suggest that patrons were not using the self-regulatory guides correctly.

A second evaluation assessed the tavern feedback procedure combined with an increased enforcement component. The subjects were the patrons of one Dartmouth tavern and one Halifax tavern studied in the first evaluation. Following the first test of self-regulation and BAC feedback, two brief enforcement operations were conducted in the Dartmouth vicinity to determine whether an enforcement campaign combined with self-regulation/BAC feedback procedures could reduce impaired driving. The first enforcement operation was in effect for four week-ends in December. A press release was issued at the beginning of the campaign and local newspapers ran several stories. In addition, media coverage was given to the hazards of impaired driving as well as to the increased enforcement activity because of the holiday season. The police spot-checks were located in close proximity to several drinking establishments in the Dartmouth area, and to the target tavern specifically on two nights during the study period. The second enforcement campaign was in effect for three week-ends commencing in late February, and spot-checks were located in close proximity to the target tavern on two nights during this period. No publicity acccompanied the second campaign. The enforcement operation was not introduced to the Halifax vicinity during the study period, thus the Halifax location served as a control.

The self-regulation and BAC feedback procedures in the second testing were basically the same as those in the first testing. During the second test, data for the enforcement condition were collected only on Thursday and Friday nights. To maintain comparability with baseline and intervention data, Saturday night data for these conditions were omitted from the analyses.

The results of the combined approach showed a short-term reduction in BACs of tavern patrons who intended to drive after drinking. Following the completion of the first enforcement campaign in Dartmouth, both the mean BAC of drivers and the percentage of impaired drivers at the experimental tavern decreased substantially. These measures remained at a low level for several weeks but returned to baseline levels by the fifth week. Only a slight decrease in mean BAC and no reduction in the precentage of impaired drivers were observed among drivers at the control tavern in Halifax. Following the completion of the second enforcement campaign, the mean BAC of drivers and the percentage of impaired drivers decreased again in the experimental sample but the reduction was neither as large nor as consistent as the reduction that followed the first enforcement campaign. No decrease on these measures was observed in the control sample over the same period. Neither the mean BACs' of passengers nor the percentage of passengers impaired changed in either the experimental or the control samples as a result of the first or second enforcement campaigns. The participation refusal rates remained fairly constant throughout the course of the study at both taverns, as did the percentage of patrons who intended to drive after drinking. The reliability of subjects' self-reports was high for both the experimental and the control samples.

This demonstration offers evidence that a comprehensive programme of self-regulation, BAC feedback and police spot-check enforcement is effective in reducing impairment among drivers leaving a public drinking establishment, although differences were not tested for statistical significance. The authors conclude that the positive effect was a result of the addition of the enforcement component to the intervention procedures because no reduction on impaired driving measures was observed in the control location over the same time period. However, there was no attempt to evaluate the effectiveness of the enforcement component in the absence of the self-regulation and BAC feedback components. The second enforcement campaign had less of an impact than the first. The authors speculate that the shorter period of operation and the absence of associated publicity were responsible for the limited effect of the second campaign. The authors also expressed some doubt that a feedback countermeasure in and of itself would be effective in reducing impaired driving based on the poor outcome of the first demonstration of the self-regulation/BAC feedback procedure and the results of another study of tavern breath- testing reported by Calvert-Boyanowsky and Boyanowsky (no date).

6.5. Summary

Eight systems-oriented countermeasure programmes were reviewed. Two combined a public information/education campaign with a change in drinking-driving legislation, five combined increased enforcement activity with a public information/ education campaign, and one involved drinking self-regulation, BAC feedback and spot-check enforcement components. Positive indications of programme effectiveness were observed in all, although methodological problems were associated with most studies preventing the drawing of any firm conclusions.

The efficacy of a mass media campaign to inform drivers of recent changes in the drinking-driving legislation and to educate the public about drinking-driving issues was demonstrated to have an **immediate** effect on raising knowledge levels: the roadside breath test legislation campaign evaluation evidenced a significant increase in general and specific knowledge of legislative changes immediately following the campaign. However, the **long-term** effects were not consistent: a significant increase in knowledge levels was observed at the two-month post-test for the ".08" breathalyzer legislation campaign evaluation but inconsistent or no change observed at the three-month post-test for the roadside breath test legislation campaign evaluation. Little sustained change was observed on measures of attitudes and opinions employed in the evaluation of the ".08" legislation campaign. A **short-term** effect on traffic safety measures was observed in the ".08" breathalyzer legislation evaluation. The two programmes reviewed demonstrate that public information/education campaigns are effective in communicating drinking-driving knowledge to the public, making the public aware of recent legislative changes and provisions of those changes, and having at least an intitial impact on drinking-driving behaviour. The campaigns were implemented at different intervention points; the breathalyzer campaign served to introduce the new laws and provisions and began prior to the public announcement of the legislative change, whereas the roadside screening campaign commenced after the law came into effect. Both campaigns made use of the press and television/radio media. Both had similar campaign content. The first campaign ran for a shorter period than the second (ie. six weeks). Both evaluation designs included a pre-test/post-test component, but only one included a control group. In summary, two demonstrations of a single mass media public campaign conducted over a period of several weeks accompanying a change in drinking-driving legislation were found to effect at least a short-term change in knowledge, attitudes and traffic safety. The long-term effects of a single campaign effort are doubtful as effects were observed to dwindle after three months. Possibly intermittent campaigns over an extended period would serve to maintain these gains.

Secondly, the combination of spot-check enforcement with a **single** public information/education campaign as demonstrated by the R.I.D.E. programme implemented in Etobicoke and Toronto generally appears to effect a **long-term** change in public awareness of police activity and knowledge levels. Risk perception, on the other hand, showed some positive increase immediately after intervention but the effects were not sustained with this programme, and in some instances fell below pre-intervention levels. The latter observation was most likely due to inconsistent enforcement activity. Such external factors have a powerful influence on programme effect. The design of a countermeasure programme may be adequate to effect a desired change, but changes in the operation of one or more of the design components (in this case enforcement level) may negate the results. The effect of the R.I.D.E. systems design on traffic safety was difficult to assess due to unavailable and inadequate data and contamination of data. Overall there were **no positive** indicators of an effect on drinking-driving behaviour.

Thirdly, there were indications that a programme utilizing spot-check enforcement accompanied by **several** public information/education campaigns conducted intermittently was **effective** in raising awareness of police activity and knowledge levels among the public, although the strength of the changes declined over time. Only one programme measured change in opinion level and there was no significant difference over a fifteen-month interval. The results of two of the programmes suggested that this systems approach may have a **positive** effect on increasing apprehension rates and reducing alcohol-related accidents and fatal crashes.

The demonstration of a programme of self-regulation of alcohol consumption, BAC feedback and police spot-check enforcement activity provided some evidence of a **short-term** reduction in impairment among drivers leaving a public drinking place. Both the mean BAC of drivers and the percentage of impaired drivers were observed to decrease among tavern patrons following a period of intervention. The positive effect was most likely due to the enforcement component of the programme and the associated publicity, as little impact was observed in the absence of the spot-check activity and the observed effect was weakened when campaign publicity was omitted. The efficacy of a BAC feedback countermeasure was questioned.

7. SUMMARY

Countermeasures to reduce impaired driving implemented in Canada have encompassed legal, mass media, rehabilitative, technological and systems-oriented approaches to combatting the problem. Generally speaking, the impact of most intervention strategies has been limited and short-term.

Legal oriented measures, such as legislation or sanctions to detect and/or deter impaired drivers, have met with results similar to those reported in non-Canadian jurisdictions. Given the low probability of being apprehended while driving after drinking, the introduction of laws aimed at drinking-driving behaviour have had only a short-term effect on traffic safety. The problem seems to rest with the discrepancy between the driving public's **perceived** risk of arrest and the **actual** risk of detection. Intermittent media campaigns to raise the subjective risk of apprehension and/or visible increased enforcement activity have been suggested as methods to increase the effectiveness of legislative intervention. Implementation of the breathalyzer legislation in Canada accompanied by a public information campaign, however, evidenced only a short-term effect on traffic safety measures and failed to produce a long-term reduction in alcohol-related accidents and fatalities. Countermeasure programmes which incorporated a component of publicized increased enforcement activity, on the otherhand, were found to have inconsistent results on traffic safety outcome. Two programmes witnessed an increase in apprehension rates and a reduction in alcohol-related accidents and fatal crashes, a third provided some evidence of a short-term reduction in impairment among drivers leaving a public drinking place, but another found no positive indicators of an effect on drinking-driving behaviour. The effectiveness of licence suspension as a prevention strategy has not been fully evaluated in Canada. The main drawback of this measure is that the risk of apprehension while driving with a suspended licence is remote. However, the potential of this sanction for increasing traffic safety by the adoption of safer driving habits to avoid detection has been raised. Demonstrations of indirect legal countermeasures indicated that control of the minimum drinking age has some effect on traffic safety, but control of alcohol sales had no observed consistent impact.

The literature documenting mass media public information/education campaigns against drinking and driving generally concludes that this type of approach has demonstrated improvements in knowledge and attitudes concerning drinking-driving but there has been litte evidence to support reductions in traffic accidents or injuries. The Canadian studies reviewed demonstrated that campaigns of this nature can be successful in producing some immediate impact on traffic safety measures. The long-term impact on traffic accidents and fatalities, however, remains to be shown.

Similarly, rehabilitation programmes for impaired drivers have generally been viewed as ineffective and Canadian programmes evaluated have not been totally inconsistent with this outcome. A general impact on traffic violations but not specifically impaired driving was documented in one study, while a reduction of impaired driving recidivisim among programme participants was reported in a few, and either no programme effect or a negative outcome were found in other programmes and systems.

Only recently have technological measures been incorporated as components of countermeasure programmes in Canada, and those employed have met with mixed results. Two demonstrations of a BAC feedback countermeasure offer little support for the efficacy of this measure as an intervention to reduce impaired driving. Little change was observed with the introduction of a self-regulation procedure to avoid impairment or BAC feedback to prevent impaired driving. Videotaped sobriety testing providing evidential material, on the otherhand, did show potential as a measure to deter impaired driving.

Finally, systems countermeasures, usually a combination of the legal and educational approaches have in all cases shown knowledge and awareness changes concomitant with the programmes. Occasionally some short-term reductions in traffic crashes or drinking-driving behaviour have been demonstrated. Some of the controlled quasi-experimental programmes have shown that change occurred only with the *combination* of countermeasures, for example, new laws introduced with public education campaigns; self-regulation/B.A.C. feedback co-ordinated with spotcheck enforcement. Otherwise, each countermeasure, individually, has little or no impact.

These findings would suggest that a systems approach would be the most practical direction for countermeasure development. Yet, even this approach has been unable to provide positive and consistent results. Unfortunately, a *systems* approach is not always a *systematic* approach, which attempts to include the many factors affecting drinking-driving crashes. In order to substantially reduce alcohol-related traffic crashes countermeasures must either reduce the quantity and/or frequency of driving performed by the drinkers or reduce the quantity and/or frequency of drinking consumed by the drivers. Countermeasures that do not provide appropriate motivation or alternative solutions for this type of behavioural change can not have much hope for success.

Furthermore, drinking-driving crashes are the result of a complex interplay of drinking and driving factors. Figure 1 is a schematic representation of the many determinants involved in drinking-driving behaviour. As can be surmised, when fewer determinants are tackled by a drinking-driving countermeasure, the opportunity for permanent change to occur diminishes. Most often when a countermeasure tackles only several determinants the other determinants present will shift accordingly to maintain an equilibrium within the system. For example, Colon and Cutter (1983) found the fatal accident data from 50 states and the District of Columbia were significantly and positively associated with beer consumption but were significantly and _inversely_ related to on-premise availability. The authors suggest that people were willing to drive farther to visit a licenced drinking premise. Therefore, by controlling consumption through the control of on-premise alcohol without attempting to change drinking customs, drinking-driving norms etc. will not reduce drinking-driving crashes.

Ideally, a systematic approach should entail the combined efforts of government, its agencies and the private sector. A jurisdiction that is willing to approach and tackle the problem at all levels and focus on both the drinking and driving behaviours of its constituents should have a greater opportunity for success, rather than circumscribed, individualistic attempts. Co-operation and collaboration should be the ultimate goal.

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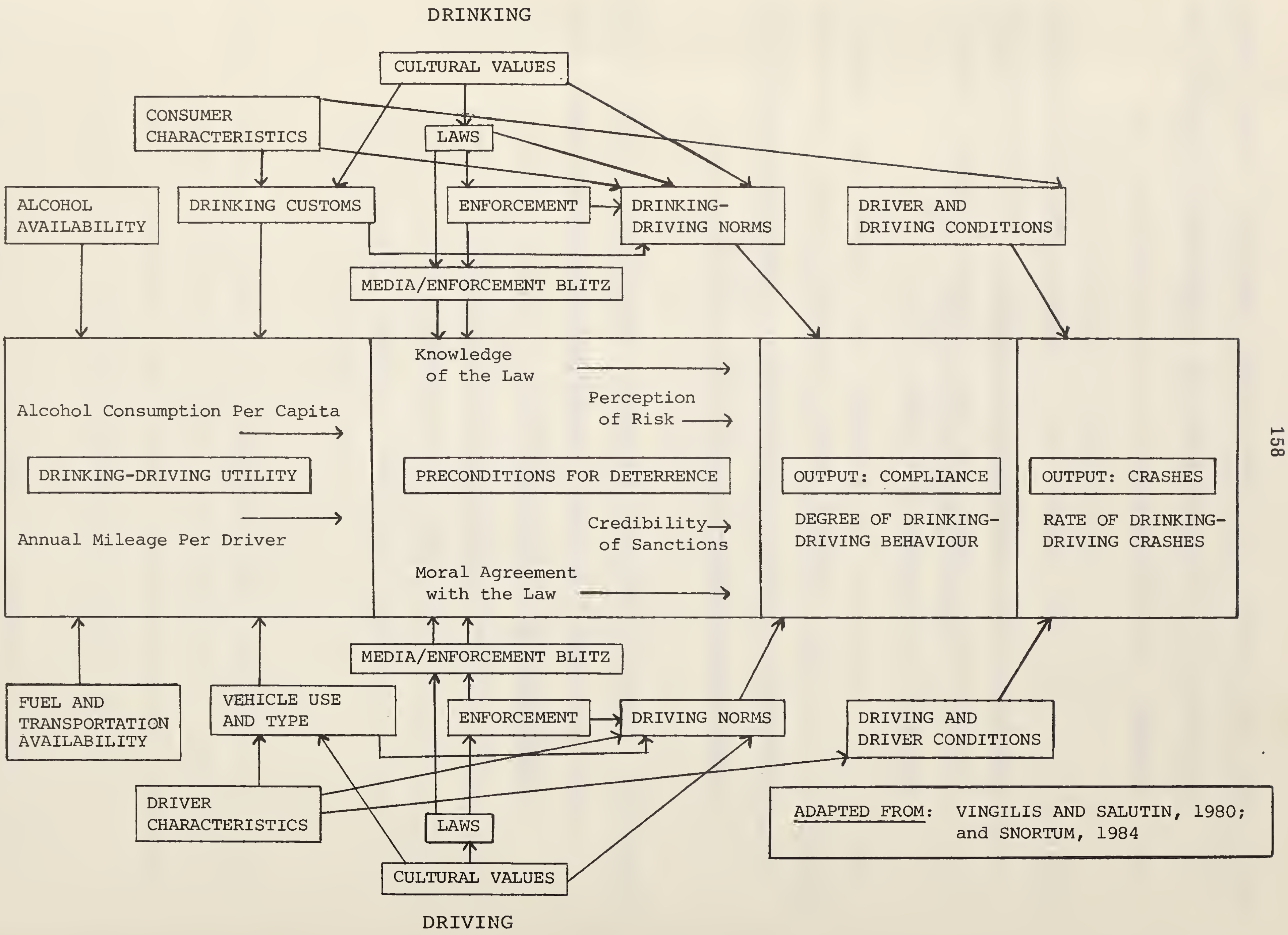
DETERMINANTS OF DRINKING-DRIVING BEHAVIOUR



ADAPTED FROM: VINGILIS AND SALUTIN, 1980; and SNORTUM, 1984

FIGURE I

TABLE 1

CANADIAN DRINKING-DRIVING COUNTERMEASURES: LEGAL APPROACH

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
COUNTERMEASURE: Increasing the legal drinking age. Trial: The legal drinking age was increased in Ontario from 18 to 19 years effective January, 1979. Evaluation: Vingilis and Smart (1981) evaluated the effect of the change by pre-/post-intervention comparisons among 16-21 year olds of monthly Ontario drinking-driving conviction statistics from 1977 to 1979 and fatality statistics from 1973 to 1979, using time series analysis. Methodological Problems: (i) the absence of a control group; (ii) insensitivity of measures to rare events; and (iii) an insufficient age increment (i.e. one year) to produce an impact.	Traffic Safety - drinking driving convictions — level change: — t value: among: 16-17 year olds — -8.75 — 0.71 (p=NS) 18 year olds — -10.47 — 0.77 (p=NS) 19 year olds — +3.45 — 0.23 (p=NS) 20-21 year olds — -385.30 — 1.92 (p=NS) - drinking-driving fatalities — level change: — t value: among: 16 year olds — +0.20 — 0.78 (p=NS) 17 year olds — -0.15 — 0.31 (p=NS) 18 year olds — +0.35 — 0.79 (p=NS) 19 year olds — -0.56 — 0.81 (p=NS) 20 year olds — -1.19 — 1.83 (p=NS) 21 year olds — +0.50 — 0.86 (p=NS)
COUNTERMEASURE: Restricting availability of alcoholic beverages. Trial: Legislation permitting local option votes on liquor policy in the Northwest Territories became effective in 1976. Evaluation: Smart (1979) compared three communities which changed alcohol control policies with two control communities which made no changes on one year pre- and post-intervention impaired driving arrest rates, using chi square analysis. Methodological Problems: (i) an outcome measure which may have been too rare an event to show an effect.	Traffic Safety - impaired driving arrest rates per 100 population: Exp. community 1 — pre = 0.9 — post = 1.3 (p=NS) Control community — pre = 1.9 — post = 2.4 Exp. community 2 — pre = 0.9 — post = 0.6 (p=NS) Control community — pre = 2.2 — post = 1.8 Exp. community 3 — pre = 4.7 — post = 3.6 (p=NS) Control community — pre = 0.5 — post = 0.0

TABLE 2

CANADIAN DRINKING-DRIVING COUNTERMEASURES: PUBLIC INFORMATION/EDUCATION APPROACH

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
COUNTERMEASURE: Mass media drinking-driving campaign aimed at general driving population. Trial: (1) A one-month campaign was conducted in Edmonton, Alberta in December, 1971. Evaluation: Farmer (1975) compared breath-test results and knowledge and attitude levels of night drivers in the campaign city with those in a control city surveyed at roadside immediately before (N = 2,230 and N = 2,162, respectively) and within 10 days after (N = 2,780 and N = 3,122, respectively) the intervention, using chi square analysis. Methodological Problems: (i) possible test reactivity; (ii) possible contamination of control data by local campaign activities; and (iii) no reporting of roadside survey refusal rate.	Knowledge Levels - % responding ".08" as maximum legal BAC: Campaign sample pre = 54.3 post = 63.2 (p<.001) Control sample pre = 45.0 post = 48.0 (p<.001) - % responding "3" as the "safe" number of drinks within a 3-hour period: Campaign sample pre = 32.7 post = 50.1 (p<.001) Control sample pre = 30.7 post = 34.3 (p<.001) - % aware of culpability below 80 mg.%: Campaign sample pre = 78.9 post = 81.2 (p = NS) Control sample pre = 69.1 post = 73.3 (p<.01) - % responding "41%-60%" alcohol involvement in traffic fatalities: Campaign sample pre = 37.3 post = 36.6 (p = NS) Control sample pre = 31.9 post = 34.3 (p = NS) Attitude Levels - % responding to adequacy of drinking-driving laws: Campaign sample: - adequate pre = 33.1 post = 41.3 - inadequate pre = 57.6 post = 50.0 (p<.001) - too tough pre = 3.5 post = 3.8 Control sample: - adequate pre = 35.8 post = 36.2 - inadequate pre = 53.1 post = 48.5 (p<.001) - too tough pre = 4.2 post = 9.0 Traffic Safety - % of drivers with BAC above 80 mg.%: Campaign sample pre = 3.0 post = 1.4 (p<.001) Control sample pre = 2.5 post = 1.7 (p = NS)

TABLE 2 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
Trial: (2) A three-week campaign was conducted in nine Ontario cities during December, 1973. Evaluation: Pierce et al. (1975) compared awareness, knowledge and attitude levels and self-reported traffic safety measures among samples of randomly selected licenced drivers in the nine campaign cities and nine control cities surveyed by telephone one month before (N = 1,122 and N = 1,053, respectively) and one month after (N = 1,120 and N = 1,054, respectively) the intervention; 95% completion rate. Methodological Problems: (i) sample differences; and (ii) statistics reporting impaired driving charges and collisions insufficient for statistical analysis.	Awareness Levels - % recalling campaign elements: Campaign sample post = 42.8 Control sample post = 18.0 - % discussing drinking-driving issues in prior month: Campaign sample pre = 42.5 post = 57.6 (p = S) Control sample pre = 43.5 post = 50.9 (p = S) Knowledge Levels - % responding ".08" as maximum legal BAC: Campaign sample pre = 34.7 post = 44.7 (p = S) Control sample pre = 33.6 post = 33.0 (p = NS) - % aware of drinking-driving penalties: (a) jail term Campaign sample pre = 74.1 post = 80.1 (p = S) Control sample pre = 77.0 post = 76.8 (p = NS) (b) fine Campaign sample pre = 94.3 post = 95.7 (p = NS) Control sample pre = 95.0 post = 94.0 (p = NS) (c) licence suspension Campaign sample pre = 96.8 post = 96.5 (p = NS) Control sample pre = 97.7 post = 96.3 (p = NS) Attitude Levels - attitude toward court enforcement of drinking-driving penalties did not change significantly from pre- to post-testing in either the campaign or control samples (percentages not available) - attitude toward adequacy of police enforcement of drinking-driving laws did not change significantly from pre- to post-testing in either the campaign or control samples (percentages not available)

TABLE 2 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
	Traffic Safety - % reporting no driving after drinking too much in prior month: Campaign sample pre = 4.2 post = 8.5 (p = S) Control sample pre = 5.3 post = 6.6 (p = NS) - % reporting intentionally not driving to a party or bar when intending to drink: Campaign sample pre = 15.0 post = 24.3 (p = S) Control sample pre = 15.6 post = 23.4 (p = S) - % reporting preventing impaired driver from driving in prior month: Campaign sample pre = 18.9 post = 25.3 (p = S) Control sample pre = 19.2 post = 24.9 (p = S)

TABLE 3

CANADIAN DRINKING-DRIVING COUNTERMEASURES: HEALTH APPROACH

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
COUNTERMEASURE: Rehabilitation programmes for convicted impaired drivers. Trial: (1) The Alberta Impaired Drivers Programme was first implemented in Edmonton in 1970 as a four-week educational course for drivers convicted of an impaired driving offence and assigned to the programme by the courts as a mandatory condition of probation. The format was later modified to a one-day course, and participation was required for licence reinstatement. Evaluation: Zelhart and Schurr (1975) compared 703 impaired drivers convicted in Edmonton and assigned to the programme during the first one-and-a-half years of operation with 657 convicted offenders assigned to a non-participation control group, on driving records over a variable 24-48 month post-intervention period, and treatment referral six months post-intervention using chi square analysis and analysis of variance. Methodological Problems: (i) non-random assignment to treatment and control groups; (ii) sample differences; and (iii) variable driving exposure for follow-up data.	Traffic Safety - % reconvicted of impaired driving: Programme group post = 17.1 (p = NS) Control group post = 16.6 - % convicted of other Criminal Code traffic offence: Programme group: - attending post = 5.7 - nonattending post = 19.6 (p<.001) Control group post = 8.9 - % convicted of Highway Traffic Act offence: Programme group: - attending post = 37.1 - nonattending post = 44.6 (p = NS) Control group post = 40.2 - % involved in traffic accident: Programme group: - attending post = 33.2 - nonattending post = 31.5 (p = NS) Control group post = 32.2 Treatment Referral - % appearing at outpatient clinic: Programme group post = 10.7 Control group post = 6.3

TABLE 3 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS		
Evaluation: Davidson (1983) evaluated the short-term impact of the modified programme on knowledge and attitude levels of participants by comparison of pre- and post-intervention questionnaire data obtained by telephone interviews one week prior to and one week after each course session in the study period. Methodological Problems: (i) no report of sampling procedures, sample size, or completion rate; and (ii) no testing for statistical significance.	Knowledge Levels		
	- % responding correctly:		
	(a) alcohol beverage equivalencies	pre = 44	post = 95
	(b) sobering effect of coffee	pre = 73	post = 94
	(c) sobering effect of shower	pre = 60	post = 95
	(d) sobering effect of exercise	pre = 34	post = 75
	(e) how alcohol is metabolized	pre = 43	post = 82
	(f) capacity estimate close or low	pre = 82	post = 95
	(g) demerit points lost	pre = 19	post = 78
	(h) convicted under Criminal Code	pre = 55	post = 70
	(i) how to get licence reinstated	pre = 58	post = 84
	(j) % fatalities involve alcohol	pre = 59	post = 70
	(k) insurance rates up 50%	pre = 90	post = 95
	(l) now have criminal record	pre = 94	post = 97
	(m) judge could suspend five years	pre = 35	post = 46
	(n) could deny entry to U.S.	pre = 68	post = 89
	Attitude Levels		
	- % responding positively:		
	(a) impaired driving should be criminal	pre = 87	post = 92
	(b) impaired driving increases risk of accidents	pre = 98	post = 99
	(c) concentration overcomes effects	pre = 83	post = 92
	(d) check stops only to make money	pre = 87	post = 96
	(e) impaired drivers irresponsible in other ways too	pre = 44	post = 51
	(f) impaired drivers drink too much for own good	pre = 71	post = 70
	(g) intend to reduce greatly drinking in future	pre = 41	post = 51
	(h) intend to reduce greatly or eliminate impaired driving in future	pre = 87	post = 85

TABLE 3 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
Trial: (2) The North Bay Impaired Drivers Programme was targeted to multiple impaired driver offenders convicted in North Bay, Ontario, assigned by the court to the programme as a mandatory condition of probation, and consisted of 12 weekly educational session including one individual therapy session. Evaluation: Poudrier (1978) compared 100 multiple offenders assigned to the programme with 41 assigned to a non-participation control group on 11 attitudinal concepts surveyed at the onset and completion of the course, using analysis of variance; and compared 150 programme participants with a random sample of 143 multiple impaired drivers convicted in Thunder Bay on recidivism over a variable (up to four years) post-conviction period, using chi square analysis. Methodological Problems: (i) quasi-random assignment to programme and control groups; (ii) no control for driving exposure for follow-up data; and (iii) no control for change in penal policy during study period.	Attitude Levels - mean factor score on "programme" concept: Programme group pre = .065 post = -.057 Control group pre = -.193 post = .159 (p<.05) - mean factor score on "drinking-driving" concept: Programme group pre = .037 post = .159 Control group pre = -.098 post = -.443 (p<.05) - the remaining nine attitudinal concepts (i.e. psychiatrists, alcoholic drinks, alcoholics, money, freedom, me, laws, police, judges) did not change significantly from pre- to post-testing (mean factor scores not available). Traffic Safety - % re-convicted of impaired driving: Programme group post = 16.0 Control group post = 32.9 (p<.001)
Trial: (3) The Oshawa Impaired Drivers Programme provided nine weekly educational sessions to multiple impaired driver offenders convicted in Oshawa, Ontario, and assigned by the court to the programme as a mandatory condition of probation. Evaluation: Vingilis et al. (1981) compared 70 multiple impaired drivers randomly assigned to the programme with 61 assigned to a non-participation control group on knowledge and attitude levels surveyed at the onset and completion of the course using analysis of variance; and driving record for a three-and-a-half year post-intervention period using analysis of covariance, survival rate analysis and t-tests.	Knowledge Levels - mean knowledge score: Programme group pre = 10.14 post = 12.03 (p<.01) Control group pre = 9.92 post = 10.31 (p = NS) Attitude Levels - mean attitude score: Programme group pre = 5.92 post = 6.44 (p<.01) Control group pre = 6.13 post = 6.30 (p<.05)

TABLE 3 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
	Traffic Safety - % re-convicted: Programme group post = 19.4 (p = NS) Control group post = 15.6 - number of alcohol-related convictions did not differ significantly between groups at follow-up (numbers not available). - number of other serious traffic offence convictions did not differ significantly between groups at follow-up (numbers not available). - total number of convictions did not differ significantly between groups at follow-up (numbers not available).
Trial: (4) The Chatham Drinking-Driving Awareness Programme was implemented in Kent County, Ontario, for first impaired driver offenders who chose to enter the programme upon conviction. Once entered in the course, completion was a mandatory condition of probation. Courses were educational and consisted of four weekly sessions. Evaluation: Markle et al. (1980) compared 129 first offenders who chose to participate in the programme with a control group of 252 first offenders who chose not to participate and a control group of 115 multiple offenders, on drinking-driving data from court records over a 4-18 month post-intervention period and a five-item self-report questionnaire; differences were not tested for statistical significance. Methodological Problems: (i) limited data source; (ii) low questionnaire return rate; (iii) non-random assignment to programme and control groups; and (iv) no control for driving exposure for follow-up data.	Traffic Safety - % re-convicted of impaired driving: Programme group post = 3.9 Control groups: - first offenders post = 1.6 - multiple offenders post = 4.4

TABLE 3 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
Trial: (5) The British Columbia Impaired Driving Course Programme was implemented throughout the province as an educational programme aimed at impaired drivers convicted and assigned to participate by the courts.	
Evaluation: Edelman et al. (1977) presented the results of a study of 138 programme participants in Nanaimo who were compared with a group of 150 local pub patrons on attitude and drinking measures obtained from a self-report questionnaire; statistical testing was not reported. Methodological Problems: (i) low response rate; (ii) inappropriate comparison group; (iii) poorly designed and administered assessment instrument; and (iv) no pre-test.	Knowledge Levels - awareness of both (a) alcohol involvement in traffic accidents, and (b) adverse consequences of drinking and driving was observed to be significantly higher among the programme group than the control group (percentages not available). Attitude Levels - the programme group was observed to be significantly more conservative about their ability to drive after drinking than the control group (percentages not available).
Evaluation: Pocock and Goldberg (1976) compared 30 programme participants in Richmond with a control group of 30 randomly selected non-participating convicted offenders on court record data for a one-year follow-up period, using time series analysis. Methodological Problems: (i) non-random assignment to programme and control groups; (ii) small sample size; and (iii) limited data source.	Traffic Safety - impaired driving conviction rate was significantly lower among the programme group than the control group (percentages not available).
Trial: (6) The Newfoundland Impaired Drivers' Programme was implemented as an educational programme for convicted impaired drivers assigned by the courts to participate as a mandatory condition of probation. The course was modified from eight sessions to a one-day session.	
Evaluation: Cake and Cooper (unpublished) evaluated the programme for the period 1979-1981. Programme participants (N = 101) were compared with a matched control group (N = 101) on impaired driving recidivism and traffic accidents for a	Traffic Safety - % re-convicted of DWI offence: Programme group post = 38 (p = NS) Control group post = 29

TABLE 3 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
two-year period prior to licence suspension and a two-year period after licence reinstatement, using chi square and survival rate analyses.	- mean number of convictions: Programme group pre = 1.8 post = 0.54 Control group pre = 1.8 post = 0.55 (p = NS) - % 'surviving' rearrest for DWI: Number of Months After Licence Reinstatement 0 6 12 18 24 Programme group 96 82 73 68 62 Control group 88 83 79 77 71 (p = NS) - % involved in traffic accidents: Programme group pre = 27 post = 19 Control group pre = 17 post = 17

TABLE 4

CANADIAN DRINKING-DRIVING COUNTERMEASURES: TECHNOLOGICAL APPROACH

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
COUNTERMEASURE: Public breathtesting. Trial: A demonstration of public breathtesting and feedback was implemented in six taverns in Vancouver, British Columbia, in 1976. Evaluation: Calvert-Boyanowsky and Boyanowsky (no date) compared intended driving behaviour as expressed in a questionnaire administered before BAC feedback with actual driving behaviour after BAC feedback among tavern patrons (N = 3,407) preparing to leave the test locations. Actual drinking-driving behaviour was measured by (i) self-report postcard to be mailed the day following the BAC feedback, and (ii) direct surveillance. Methodological Problems: (i) no baseline data for outcome measures; (ii) low return rate of self-report postcard (33.4%); and (iii) anti-drinking-driving campaign in effect during study period.	Traffic Safety - % of intended impaired drivers who did not drive after leaving tavern: post = 11 - 33
COUNTERMEASURE: Video-taped sobriety tests. Trial: Sobriety test performance documented on videotape and admissible as evidence in court was introduced in Vernon, British Columbia in 1978. The measure was publicized locally via the media. Evaluation: Rockerbie (1980) reports the results of a comparison of drinking-driving offences and charges contested in court for a six-month period pre- and a six-month period post-intervention, using chi square analysis. Methodological Problems: (i) absence of a control group.	Traffic Safety - number of drinking-driving offences decreased significantly ($p<.05$) from pre- to post-intervention (numbers not available) - % of charges contested in court: pre = 18 post = 30

TABLE 5

CANADIAN DRINKING-DRIVING COUNTERMEASURES: SYSTEMS APPROACH

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
COUNTERMEASURE: Legislation accompanied by a public information/education campaign. Trial: (1) Federal legislation was introduced in 1969 stipulating that driving with a BAC above 80 mg. % and refusing to take a breathalyzer test were both Criminal Code offences. A single national mass media campaign to inform drivers of the new law was conducted prior to the effective date. Evaluation: Campaign effectiveness was evaluated by Kates et al. (1970). A nation-wide two-wave telephone survey of campaign content and attitudes among representative samples of drivers was conducted in 39 communities, 1,000 in each wave, one week prior to and 10 weeks after the onset of the campaign, and changes in knowledge and attitude levels from pre- to post-testing were tested for statistical significance; statistical tests were not reported.	Knowledge Levels - % responding: (a) breathalyzer mandatory throughout Canada: pre = 13 post = 49 (p = S) (b) 80 mg. % as critical BAC level: pre = 11 post = 72 (p = S) (c) $1,000 as maximum fine penalty: pre = 1 post = 30 (p = S) (d) six months as maximum jail term: pre = 9 post = 25 (p = S) (e) breathtest refusal a punishable offence: post = 10 (f) a change in drinking-driving laws: pre = 50 post = 83 (p = S) (g) new legislation as Federal: pre = 8 post = 42 (p = S) (h) Dec. 1, 1969 effective date: post = 25 (i) breathtests used by police: pre = 71 post = 91 (p = S) (j) culpability below 80 mg. %: pre = 35 post = 31 Attitude Levels - % responding: (a) need for stricter drinking-driving laws: pre = 66 post = 33

TABLE 5 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
	(b) usually drink at home did not change significantly from pre- to post-testing (percentages not available) (c) estimated number of drinks "safely" consumed prior to driving did not change significantly from pre- to post-testing (percentages not available) (d) self-perceived driving performance after drinking did not change significantly from pre- to post-testing (percentages not available) (e) setting of personal rules for drinking and driving did not change significantly from pre- to post-testing (percentages not available)
Evaluation: Carr et al. (1974) evaluated the effect of the new legislation on traffic safety. National and Ontario monthly injury and fatal accident statistics were examined for trends from January 1969 to April 1970; impairment among fatally injured drivers was examined from available coroners' data from 1969 to 1971; and national and Ottawa drinking-driving charges for 1969 and 1970 were compared for pre- / post-intervention changes. Methodological Problems: (i) absence of a control group; (ii) non-standardized reporting format among provinces; and (iii) incomplete data.	Traffic Safety - number of fatal accidents: pre(1969) = 4,549 post(1970) = 4,264 post(1971) = 4,670 post(1972) = 5,233 - nighttime fatal crashes as % of total fatal crashes: pre(1969) = 29 post(1970) = 27 - weekend fatal crashes as % of total fatal crashes: pre(1969) = 58 post(1970) = 56 - proportion of fatally injured drivers impaired at 100 mg.% or above did not change significantly from pre- to post-test (percentages not available) - mean BAC of drivers tested: pre(1969) = 210 mg.% post(1970) = 190 mg.% - mean BAC of accident-involved drivers: pre(1969) = 200 mg.% post(1970) = 180 mg.% - mean BAC of nonaccident-involved drivers: pre(1969) = 220 mg.% post(1970) = 180 mg.%

TABLE 5 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
Trial: (2) In 1976, the Criminal Code was amended to provide for roadside breath samples at the request of a police officer on the suspicion that the driver had been drinking. The legislation was proclaimed at different times in different provinces. A six-week multi-media public information campaign was implemented in some Ontario communities in 1977 subsequent to the proclamation of the new law in the province. Evaluation: The impact of the public information campaign was evaluated by Cousins (1980). The results of a three-wave telephone survey of randomly selected male 18+-year old drivers who drink conducted in two campaign cities and two control (i.e. no campaign) cities, 150 per city per wave, one week prior and one week (post 1) and three months (post 2) after the campaign were compared for pre/post changes on measures of awareness, knowledge and attitudes, using chi square analysis and analysis of variance.	Awareness Levels - % recalling campaign components: (a) TV commercial: Campaign sample pre = 29 post(1) = 80 ($p<.01$) post(2) = 61 ($p<.001$) (b) newspaper ad: Campaign sample pre = 16 post(1) = 36 ($p<.01$) post(2) = 27 ($p<.03$) Knowledge Levels - % generally aware of legislative change: Campaign sample pre≈49 post(1)≈65 Control sample pre≈55 post(1)≈47 ($p<.001$) - % responding roadside testing as legislative change: Campaign sample pre≈ 9 post(1)≈23 Control sample pre≈ 4 post(1)≈ 7 ($p<.01$) - % responding drivers suspected of drinking required to take a roadside breathtest: Campaign sample pre≈10 post(1)≈21 Control sample pre≈ 4 post(1)≈ 3 ($p<.01$) Attitude Levels - subjective perception of both (a) the average man's risk and (b) own risk of arrest for impaired driving did not change significantly from pre- to post-testing among the campaign and control samples (percentages not available). - perceived probability of being stopped by police did not change significantly from pre- to post-testing among the campaign and control samples (percentages not available).

TABLE 5 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
	- perceived probability of being stopped by police, detected for impaired driving and charged increased significantly from pre- to post-testing among the campaign sample but not the control sample (percentages not available).
COUNTERMEASURE: Police spot-check enforcement activity accompanied by public information/education campaigns. Trial: (1) The Etobicoke R.I.D.E. Programme was implemented in Etobicoke, Ontario, in 1977, and consisted of daily random roadside spot-checks at more than 100 locations combined with a single household mailing campaign of information describing the programme during the first two weeks of the intervention. Evaluation: Vingilis et al. (1980) compared the results of a three-wave telephone survey conducted at one month pre-intervention and one month (post 1) and 10 months (post 2) post-intervention among 150 Etobicoke and 150 control randomly selected residents per wave, for pre/post changes in awareness, knowledge and attitude levels using analysis of variance; and compared Etobicoke and control districts on 21 month pre- and one year post-intervention impaired driving charges, 5 years pre- and 18 months post-intervention alcohol-related collisions, and three-and-a-half years pre- and 18 months post-intervention BAC of randomly tested drivers using time series analysis and t-tests. Methodological Problems: (i) confounding of control data by media coverage; (ii) absence of pre- and post-intervention surveys and controls to measure change in drinking-driving behaviour; (iii) analysis of traffic measures limited by small numbers; (iv) contamination of accident data by change in reporting policy; and (v) incomplete BAC data.	Awareness Levels - % aware of R.I.D.E. programme increased significantly ($p<.001$) at post(1) and post(2) from pre-test among the campaign sample (percentages not available) Knowledge Levels - mean knowledge score: Campaign sample pre = 1.58 post(1) = 2.37 post(2) = 1.93 ($p<.01$) Control sample pre = 1.49 post(1) = 1.45 post(2) = 1.53 (p = NS) Attitude Levels - mean score of perception of own risk of apprehension for impaired driving did not change significantly from pre- to post-testings among the campaign and control samples (scores not available). - mean score of perception of average person's risk of apprehension for impaired driving: Campaign sample pre = 3.35 post(1) = 2.67 post(2) = 3.02 ($p<.01$) Control sample pre = 3.07 post(1) = 2.90 post(2) = 2.98 (p = NS)

TABLE 5 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
	Traffic Safety - number of impaired driving charges laid decreased significantly (p<.05) from pre- to post-intervention in the R.I.D.E. district but not in the control districts (numbers not available) - number of alcohol-related collisions did not change significantly from pre- to post-intervention in either the R.I.D.E. or control districts (numbers not available) - proportion of total collisions 'alcohol-related' did not change significantly from pre- to post-intervention in either the R.I.D.E. or control districts (percentages not available) - number of alcohol-related injury collisions did not change significantly from pre- to post-intervention in either the R.I.D.E. or control districts (numbers not available) - proportion of total injury collisions 'alcohol-related' did not change significantly from pre- to post-intervention in either the R.I.D.E. or control districts (percentages not available) - BAC of drivers suspected of impairment did not change significantly from pre- to post-intervention in either the R.I.D.E. or control districts (mean BACs not available) - BAC of collision-involved drivers did not change significantly from pre- to post-intervention in either the R.I.D.E. or control districts (mean BACs not available) - BAC of randomly tested drivers did not change significantly from pre- to post-intervention in either the R.I.D.E. or control districts (mean BACs not available)
Trial: (2) The Toronto R.I.D.E. Programme was implemented in all police districts of Metro Toronto in 1979, and consisted of police spot-check activity and public information dissemination.	

TABLE 5 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
Evaluation: Vingilis et al. (1981) compared the results of a three-wave telephone survey conducted at one month pre-intervention and four months (post 1) and one-and-a-half years (post 2) post-intervention among 100 Metro Toronto and 100 control randomly selected 18+-year old resident drivers per wave, for pre/post changes in awareness, knowledge and attitude levels using analysis of variance; and compared three-and-three-quarter year pre-intervention and one year post-intervention police monthly impaired driving charges and pre- post-intervention accident data for Metro Toronto and a control city using time series analysis; and compared the results of a pre- post-intervention survey of police attitudes and enforcement for a Metro Toronto sample and a control sample. Methodological Problems: (i) contamination of Metro Toronto data by previous campaign in Etobicoke, and of control data by a similar campaign implemented in a bordering area; and (ii) inconsistent enforcement due to manpower shortage.	Knowledge Levels - mean knowledge score: R.I.D.E. sample pre = 2.52 post(1) = 2.68 post(2) = 2.88 (p = S) Control sample pre = 2.03 post(1) = 2.34 post(2) = 2.64 (p = S) Attitude Levels - mean score of perceived personal risk of apprehension for impaired driving: R.I.D.E. sample pre = 2.54 post(1) = 2.74 post(2) = 2.97 Control sample pre = 2.96 post(1) = 2.96 post(2) = 2.73 - mean score of perceived average man's risk of apprehension for impaired driving did not change significantly from pre- to post-tests among R.I.D.E. and control samples (scores not available) Traffic Safety - number of impaired driving charges increased significantly ($p < .01$) for R.I.D.E. district 4, decreased significantly ($p < .01$) for district 5, and did not change for districts 1 and 3 from pre- to post-intervention. No significant differences were observed in the control area of Ottawa (statistics not available) - number of fatal accidents did not change significantly from pre- to post-intervention in either R.I.D.E. or control districts (numbers not available) - number of injury accidents did not change significantly from pre- to post-intervention in either R.I.D.E. or control districts (numbers not available) - total number of accidents did not change significantly from pre- to post-intervention in either R.I.D.E. or control districts (numbers not available) - number of alcohol-related accidents did not change significantly from pre- to post-intervention in either R.I.D.E. or control districts (numbers not available) - police perception of enforcement did not change significantly from pre- to post-intervention among the R.I.D.E. or control samples (percentages not available)

TABLE 5 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
Trial: (3) The Niagara Drinking and Driving Project combined police spot-check activity with intermittent public information/education campaigns over a two-year period in the Niagara Region of Ontario, beginning in late 1979. Evaluation: Clayton (unpublished) compared pre/post-intervention changes in awareness, knowledge and attitude levels, using chi square analysis and analysis of variance, from the results of a three-wave telephone survey of systematically selected drivers 18+ years of age conducted at one month pre-intervention (N = 308), and at seven months (post 1) and 14 months (post 2) post-intervention (N = 274 and 144, respectively). Methodological Problems: (i) no control group; (ii) contamination of pre-test data by onset of enforcement campaign and programme publicity; (iii) low response rate; (iv) inconsistent interviewing procedures over three waves; and (v) limited comparable data.	Awareness Levels - % aware of Niagara R.I.D.E. enforcement activity: pre = 17 post(2) = 96 (p<.001) - % correctly identifying Niagara R.I.D.E. acronym: pre = 2 post(2) = 15 (p<.001) Knowledge Levels - knowledge score did not change significantly from post(1) to post(2) (scores not available) - % correctly responding legal BAC limit increased significantly (p<.001) from pre- to post-test (percentages not available) Attitude Levels - mean opinion score did not change significantly from post(1) to post(2) (scores not available)
Trial: (4) The Alberta CHECK-STOP Programme combined increased police enforcement activity with two mass media campaigns several months in duration, and was implemented throughout Alberta beginning in late 1973. Evaluation: A report by the Alberta Solicitor General (1974) describes the results of a four-phase telephone survey conducted with samples of 300 residents aged 18+ years prior to, midway through (post 1) and approximately two months (post 2) after the first media campaign, and with a sample of 500 approximately two months (post 3) after the second media campaign, comparing pre/post-intervention changes in knowledge and attitude measures; and police traffic statistics and coroners' data were compared for a four-month period the year prior to the intervention with a similar period post-intervention.	Awareness Levels - % aware of CHECK-STOP police enforcement activity: post(1) = 79 post(2) = 71 post(3) = 58 - % correctly identifying CHECK-STOP programme: post(1) = 44 post(2) = 55 post(3) = 41 Knowledge Levels - % correctly recalling statistical information did not change significantly from pre- to post-test (percentages not available)

TABLE 5 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
Methodological Problems: (i) no control group; (ii) positively loaded questionnaire items; and (iii) inconsistent enforcement activity.	Attitude Levels - % aware of drinking-driving as a serious problem increased from pre- to post-test (percentages not available) - % satisfied with drinking-driving public education increased from pre- to post-test (percentages not available) - % satisfied with police activity to reduce drinking-driving increased from pre- to post-test (percentages not available) - % expressing need for more drinking-driving countermeasures increased from pre- to post-test (percentages not available) - % accepting CHECK-STOP programme increased from pre- to post-test (percentages not available) - % responding that CHECK-STOP was an effective countermeasure increased from pre- to post-test (percentages not available) Traffic Safety - number of fatal accidents: pre = 73 post = 67 - % of fatal accidents involving alcohol: pre = 55 post = 38 - number of arrests for alcohol-related driving offences: pre = 1,623 post = 2,071
Trial: (5) The COUNTERATTACK Programme was implemented throughout British Columbia commencing in 1977, and combined three intermittent public information/education campaigns with a police enforcement programme utilizing mobile breathalyzer units. Evaluation: Rockerbie (1980) reports public awareness of the mass media campaigns from the results of two surveys conducted at 18 months and two years post-intervention; and a one year pre/post-intervention comparison of traffic collisions, charges and temporary licence suspensions using time series analyses.	Awareness Levels - % recalling: (a) television ads: post(1) = 85.9 post(2) = 73.1 (b) radio ads: post(1) = 12.2 post(2) = 68.0 (c) bogus ads: post(1) = 6.8 - 11.7

TABLE 5 Continued

COUNTERMEASURE AND EVALUATION	OUTCOME MEASURES AND RESULTS
Methodological Problems: (i) no control group; and (ii) no pre-test.	Traffic Safety - reduction from pre- to post-intervention in alcohol-related fatal crashes: 19.5% - increase from pre- to post-intervention in nonalcohol-related fatal crashes: 16.1% - number of impaired driving charges: pre(1976) = 23,036 post(1977) = 22,426 post(1978) = 21,219 - number of 24-hour licence suspensions: pre(1976) = 17,712 post(1977) = 19,937 post(1978) = 19,678
COUNTERMEASURE: BAC feedback to the driving public combined with police spot-check enforcement campaign. Trial: (1) A demonstration of the distribution of drinking self-regulation guides and BAC feedback to tavern patrons combined with police spot-check activity was implemented in selected locations in Halifax and Dartmouth, Nova Scotia. Evaluation: Nau and Van Houten (1984) evaluated first the self-regulation/feedback procedure in the absence of spot-check activity by comparing measures of impairment derived from a self-report questionnaire and breathalyzer tests among samples of patrons surveyed at four public drinking establishments before and after the introduction of the intervention; and then the enforcement component was introduced in Dartmouth while Halifax was designated a control, and measures of impairment derived from the tavern sample surveys were compared. Data was not tested for statistical significance.	Traffic Safety - mean BAC estimate of drivers: (a) self-regulation/feedback only condition: Dartmouth sample pre = 110 mg.% post = 97 mg.% Halifax sample pre = 115 mg.% post = 131 mg.% (b) self-regulation/feedback and enforcement condition: - a larger decrease from pre- to post-intervention was observed in the experimental than the control sample (mean BACs not available) - % drivers impaired: (a) self-regulation/feedback only condition: Dartmouth sample pre = 51 post = 44 Halifax sample pre = 54 post = 63 (b) self-regulation/feedback and enforcement condition: - a decrease from pre- to post-intervention was observed in the experimental sample but not the control sample.